AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Convenient Foundry Arrangement.

The first step to be taken by a manufacturing concern, after having decided to build a new foundry, is to visit the best foundries within a reasonable distance of their location as well as to search all the available books and other literature in order to arrive at a wise decision as to what will be the best system to adopt. After the general plan has been mapped out, a combination of the best known arrangement of buildings and details of foundry appliances is made with the certainty of attaining superior results.

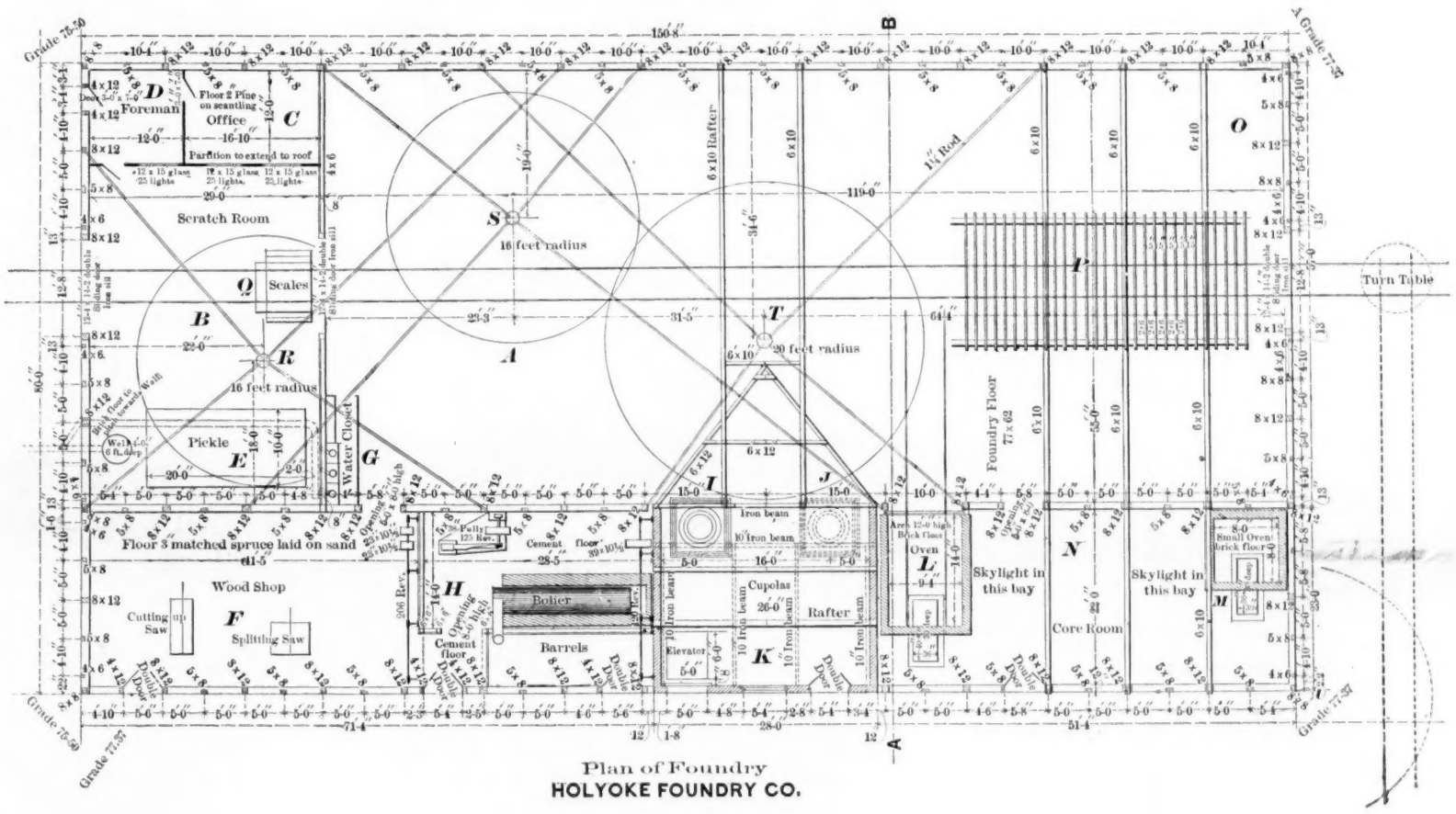
The accompanying engravings, on pages 1 and 2, represent an elevation plan and section of a foundry which is the result of a very careful study of the most desirable advantages sought for in a general foundry practice. This foundry was recently built by the Holyoke (Mass.) Foundry Co.

The main building is 150 feet 8 in. long, by 80 feet wide. The side elevation shows an external view of this building, and from the large number of windows the reader will readily conjecture that light (a most essential feature about a foundry) has in this instance received the necessary consideration. The cupolas, of which there are two, are located nearly in the center of the building, measuring lengthwise. These cupolas are of peculiar construction, and will be described in a future issue. The building has a brick wall 4 ft. 6 in. high at the base, upon which the frame work of the building is erected. This wall is for the purpose of protecting the woodwork, as it would soon be rotted away by piling wet sand against it. Above this brick wall windows have been placed, as many as possible around the entire building. The main room for moulding is 150 ft. by 57 ft. wide, divided from the other rooms by a partition, as shown in the sectional view through *A*, *B*. The frame work of the building is of heavy timber, the principal dimensions of which are given in the engravings. The roof is heavily trussed, and covered with slate.

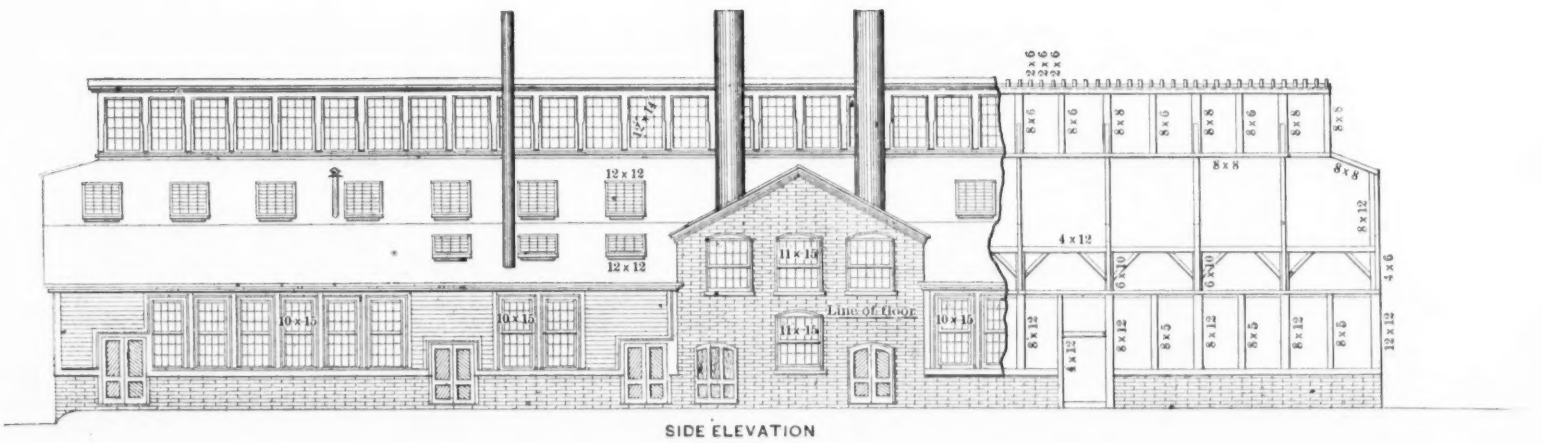
A monitor or ventilator rises almost the entire length of the roof, having pivoted windows at the sides. These windows are connected together in short sections, each of which is operated with ease from the floor of the foundry. Thus the light and ventilation are readily controlled. Where much core work is done, it is absolutely necessary to have a good light to produce good results. Good castings are sometimes made in dimly lighted foundries, but such instances are the exception and not the rule. Where the former statement is true, the workmen have been long employed in that particular foundry, and perform certain details of their work habitually, or by a sort of intuitive knowledge. It will be observed that the roof also is well provided with windows as well as the sides of the building.

In the foundry proper there are two cranes for handling flasks and castings, one of which is of ten tons' capacity, located near the center of the room, at *T*. This crane covers a radius of 20 feet, including the two 36-inch cupolas *I*, *J*. The other crane, at *S*, is of five tons, covering a radius of 16 feet. Another crane of five tons' capacity is located in the scratch room at *R*, and is used in cleaning and loading castings. A railroad track runs through the center of the foundry, with a scale, *Q*, in the scratch room, being so arranged that a car-load of castings can be readily weighed.

Outside the building is a turn-table, as shown, for connecting with other parts of the premises. A fourth crane, *U*, is located at the corner of the building for the heavy outdoor work that usually pertains to a foundry. The core room, *N*, is 51 feet × 22 feet. Within this room there are two core ovens, the largest, *L*, being 14 feet × 9 feet in inside, while the smallest, *M*, is 8 feet × 8 feet inside. The arrangement of these ovens enables the workmen to make and bake cores as large as those required for a steam



Plan of Foundry
HOLYOKE FOUNDRY CO.



SIDE ELEVATION

cylinder of 18 in. in diameter. These cores have been made, baked and used in the mould between the hours of 10 A. M. and 3 P. M. the same day, which is remarkably quick work.

Usually, the core is made up one day and used the next, so that two days are generally consumed in making castings requiring large cores. The core room is provided with the usual fixtures and appliances for rapidly making cores for their pump specialties. The space *O* is filled with moulding machines and benches for the lighter work, while the floor at *A*, and about the cranes, *S*, *T*, is used for the heavier moulding. *P* represents a part of the roof of the monitor, showing the rafters. The room, *K*, underneath the cupola platform, is used for sprues and stock, from which the material is taken up by an elevator to the platform above. A No. 4½ Baker blower is used, making 110 revolutions per minute. This plant is so efficient that melted iron flows from the cupola in eight minutes from the time the blower is started, 8,800 pounds having been melted in one cupola in precisely an hour and thirty-five minutes. The horizontal tubular boiler used is about 30 horse power, and drives a 20 horse-power horizontal engine, located at *H*. Besides driving the blower, this engine furnishes power to operate the machinery in the wood shop, consisting of saws and other special machines.

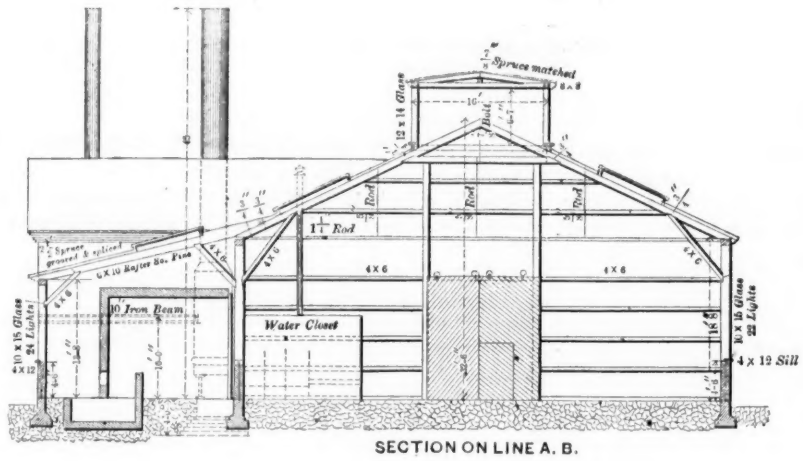
The office, *C*, is 16 ft. 10″x12 ft., and is so situated that it commands a general view of the foundry. The foreman has a private room, *D*, 12x12 ft. This foundry is well provided with radiators, and is heated by steam so that the workmen can go about their work without danger of freezing their fingers and having to leave their work to warm themselves at the stove. It pays well to have a foundry well heated, so as to prevent irritation and dissatisfaction among the workmen, which in turn is sure to effect the quality of the castings produced. While pouring off, the large openings made by opening the windows in the monitor permits most of the gas and vitiated atmosphere to escape. Running parallel with the side of the foundry occupied by the boiler, cupolas, cores, wood-shop, etc., is a long shed made of extra heavy plank, which contains moulding sand, coal, lumber and core sand. A large yard space is set apart for pig iron and scrap stock to be used in the cupolas.

These materials are stored as nearly as possible opposite the places where they are to be used.

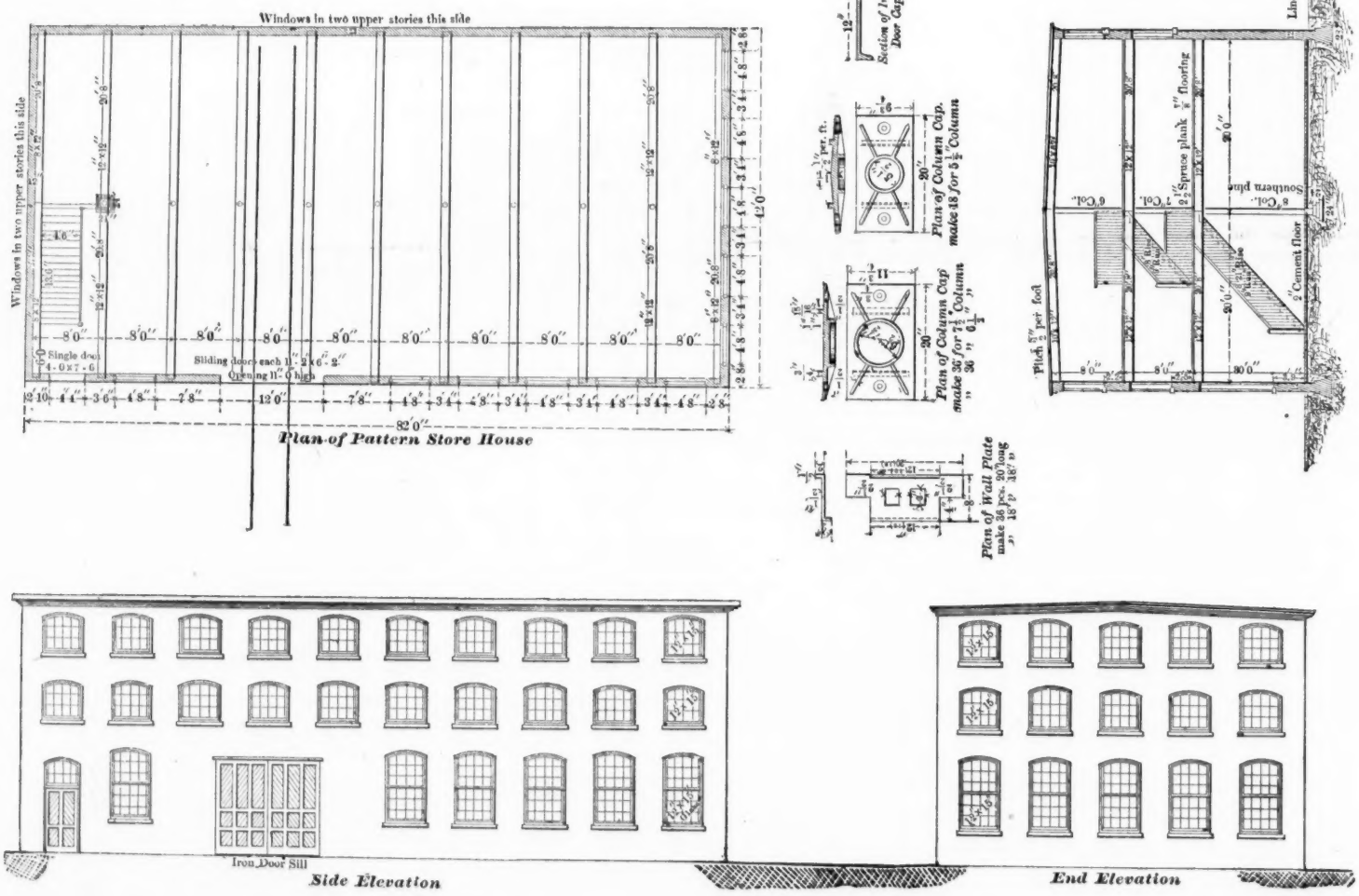
It will be observed that this general arrangement of foundry, together with railroad running through the entire building, offers every facility for the easy and quick handling of castings and other materials. A scale is placed in the floor of the cupola platform so that all material, such as coal and iron, may be weighed at the time of charging the cupola. The main building has been so designed that the end toward the turn-table can be removed and an addition of 50 feet made, which will then bring the cupolas in the center of the building lengthwise.

The pattern storehouse is one of the most convenient that we have ever seen. The walls are of brick, with a liberal supply of windows, as will be seen from the engraving. The building is three stories high, the lower one being 11 feet between the floor and ceiling, while the second and third floors are but 7 feet. The lower part of the building is used for storing large patterns, while the other two are used for smaller ones. The two upper floors have shelves as high as the ceiling, so that a person is not compelled to climb upon a step-ladder to reach the upper shelf. Furthermore, a greater number of patterns can be classified and more quickly found when required for use than by any other system that we have ever seen. The columns are all of Southern pine, capped with iron, the details of which will be readily understood from the engravings. The floor beams are unusually heavy, and have their corners well rounded so as to offer the greatest possible resistance. The entire building is of extra heavy material, and made so that it would burn very slowly should it take fire at any time.

A railroad connects this building with the foundry, so that the transportation of patterns in large or small numbers is easily accomplished between the two buildings, and without unnecessary wear and tear.



SECTION ON LINE A. B.



Locomotive Engine Running.

By Angus Sinclair.

HOW LOCOMOTIVE ENGINEERS ARE MADE—VARIOUS METHODS OF SELECTING MEN FOR THE RUNNING OF LOCOMOTIVES—SYSTEMS OF APPOINTING FIREMEN—KINDS OF EXAMINATION FIREMEN MUST PASS BEFORE BEING PROMOTED.

Locomotive engine running is one of the most modern of trades, consequently its acquirement has not been controlled by the exact methods associated with ancient guild apprenticeships. Nevertheless, graduates to this business do not take charge of the iron horse without the full meed of experience and skill requisite for performing their duties successfully. The man who runs a locomotive engine on our crowded railroads has so much valuable property, directly and indirectly, under his care, so much of life and limb depending upon his skill and ability, that railroad companies are not likely to entrust the position to those with a suspicion of incompetency resting upon them.

The prevailing methods of raising locomotive engineers have been evolved from experience with the kind of men best adapted to fill the position. In the early days of the railroad world, when such men as George Stephenson, Horatio Allen, John B. Jervis, Ross Winans, and other pioneer engineers demonstrated the successful operation of the locomotive, they usually turned over the care of their engines to the men who had assisted in constructing the machines, or in putting them together. This was the best that could be done at the time, and the men selected generally proved competent for the trust reposed in them, but it gave rise to a belief that no man could run a locomotive successfully unless he was a machinist. The possession of mechanical skill necessary for making repairs was considered the best recommendation for an engineer. Under this system, all that a machinist required to do—so that he could graduate as a full-fledged engineer—was to practice moving engines round in the yard for a few days, when he was reported ready for the road. Akin with this sentiment was that which recommended youths, of natural mechanical ability, for the

position of locomotive engineer without subjecting them to any previous special training. Graduates from mechanical institutes were deemed capable of running an engine as soon as they were perfectly certain about how to start and stop the machine. The late Alexander L. Holley used to relate an anecdote of this kind of an engineer. During a severe winter storm, the train Holley was traveling on got firmly stalled in a snow-bank. In her struggles with the frozen elements, the engine got short of water, and Holley found the engineer trying to fill the boiler by shoveling snow down the smoke-stack!

But it came to pass that more light in the matter of engine running dawned upon the minds of railroad managers. They discovered that expertness in effecting repairs on locomotives was not so essential in an engineer as was the less pretentious ability of working the engine so that the train would be pulled over the road safely and on time; they perceived but scanty merit in inherited mechanical genius, which did not inspire a youth with sagacity enough to see that certain destruction would befall the heating surface when he attempted to run without water in the boiler. Experience demonstrated that, to manage an engine on the road so that its best work should be developed at the least cost, certain traits of skill and training were necessary, which were altogether different from the culture that made a man smart at constructing or repairing machinery. It was found that one man might be a good machinist and yet make no kind of a decent runner; a second man would be equally expert in both capacities, while a third man who never could do a respectable job with tools, developed into an excellent engineer. One of the best millwrights I ever knew, a man who achieved considerable celebrity for skill in his craft, became a fireman with the ambition of becoming a locomotive runner. He fired acceptably for two years, then was promoted, but quickly found that he could not run an engine, and acknowleged that to be the case by returning to the left side. He was too nervous, and lacked confidence in himself. Overweening egotism is not an attractive feature in a man's character, but, everything else being equal, it is the self-confident man that makes the successful engineer.

The experiment of raising locomotive engineers from machinists and mechanical empirics was the uncertain groping in the dark for the right man to fill the right place. When the search for pretentious men proved unsatisfactory, the right men were found at hand, accumulating the necessary experience on the firemen's side of the engine. Then it became a recognized fact, that to take hold and run an engine to advantage, a man must learn the business by working as fireman. There have been frequent cases of men becoming successful locomotive engineers without any previous training as firemen, but they were the exceptions that proved the rule.

In the matter of speed alone, there is much to learn before a man can safely run a locomotive. During daylight a novice will generally be half out in estimating speed, and his judgment is merely wild guess work, regulated more by the condition of the track than by the velocity his train is reaching. On a smooth piece of track, he thinks he is making twenty-five miles an hour when forty miles is about the correct speed; then he strikes a rough portion of the road bed, and concludes he is tearing along at thirty miles an hour, when he is scarcely reaching twenty miles, since the first lurchy spot made him shut off twenty per cent. of the steam. At night the case is much worse, especially when the weather proves unfavorable. On a wild, stormy night, the accumulated experience of years on the footboard, which trains a man to judge of speed by sound of the revolving wheels, and to locate his position between stations from a tree, a shrub, a protruding bank, or any other trifling object that would pass unnoticed by a less cultivated eye, is all needed to aid an engineer in working along with unvaried speed without jolt or tumult. On such a night, a man strange to the business cannot work a locomotive and exercise proper control over its movements. He may place the reverse lever-latch in a certain notch and keep the steam on; he can regulate the pump after a fashion and watch that the water shall not get too low in the boiler; he can shut off in good season while approaching stations and blunder into each depot by repeatedly applying steam; but he exerts no control over the train, knows nothing of what the engine is doing, and is constantly liable to break the train in two. A diagram of his speed would fluctuate as irregularly as the profile lines of a bluffy country. This is where a machinist's skill does not apply to locomotive running until it is supplemented by an intimate knowledge of speed, of facility at handling a train and keeping the couplings intact, and of insight into the best methods of economizing steam.

These are essentials which every man should possess before he is put in charge of a locomotive on the road. The great fund of practical knowledge, which stamps the first-class engineer, is amassed by general labor during years of vigilant observation on the footboard, amidst many changes of fair and foul weather.

As passing through the occupation of fireman was the only way men could obtain practical knowledge of engine running before taking charge, railroad officials all over the world gradually fell into the way of regarding that as the proper channel for men to traverse before reaching the right hand side of the locomotive.

As the pay for firemen rules moderately good, even when compared with other skilled labor, and, as the higher position of engineer looms like a beacon not far ahead, there is always a liberal choice of good men to begin work as firemen. Most railroad companies recognize the importance of exercising judgment and discretion in selecting the men who are to run as their future engineers. Sobriety, industry and intelligence are essential attributes in a fireman who is going to prove a success in his calling. Lack in any one of these qualities will quickly prove fatal to a fireman's prospects of advancement. Sobriety is of the first importance, because a man who is not strictly temperate should not be tolerated for a moment about a locomotive, since he is a source of danger to himself and others; industry is needed to lighten the burden of a fireman's duties, for oftentimes they are arduous beyond the conception of strangers; and wanting in the third quality, intelligence, a man can never be a good fireman in the wide sense of the word, since one deficient in mental tact never rises higher than a human machine. An intelligent fireman may be ignorant of the scientific nomenclature relating to combustion, but he will be perfectly familiar with all the practical phenomena connected with the economical generation of steam. Such a man does not imagine that he has reached the limit of locomotive knowledge when he understands how to keep an engine hot, and can shine up the jacket. Every trip reveals something new about his art, every day opens his vision to strange facts about the wonderful machine he is learning to manage. And so, week by week, he goes on his way, attending cheerfully to his duties, and accumulating the knowledge that will eventually make him a first-class locomotive engineer.

On the various roads throughout the North American Continent there is great diversity of practice in the selection of men for the position of firemen.

On numerous roads, especially in the Western States, men are taken from all occupations, no preliminary training being deemed necessary before putting a man on an engine as fireman. A list of applicants is kept by the master mechanic and likely men recommended for fireman. When a man is wanted, the first one who can be found conveniently is sent out, and the engineer must break him in as best he can. On other roads, again, the men intended for firemen are taken to work about the round-house, and are employed in helping with the cleaning, repairing and preparing of locomotives for the road. This plan is greatly in vogue in Europe, and on certain of the older roads of America, and it has many features to recommend it over the practice of placing men entirely devoid of railroad experience upon engines. It is better for the men themselves, since working about engines familiarizes them to some extent with the work they are expected to do as an engineer's helper, for that is really a fireman's position; it is better for the company, since the officers get the opportunity of observing a man's habits before his receiving training that entails some expense; it is better for the engineer, since his assistant is not entirely strange to the work he is expected to do. A youth entirely unacquainted with all the operations which a fireman is called upon to perform finds the first trip a terribly arduous ordeal, even with some previous experience of railroad work. When his first trip introduces him to the locomotive and to railroad life at the same time, the day is certain to be a record of personal tribulation. To ride for ten or twelve hours on an engine for the first time, standing on one's feet, and subject to the shaking motion, is intensely tiresome if a man has no work to do. But where he has to ride during that period, and in addition has to shovel six or eight tons of coal, most of which has to be handled twice, the job proves no sinecure. Then the posture of his body while doing work is new; he is expected and required to pitch coal on to certain exact spots, through a small door, while the engine is swinging about so that he can scarcely keep his feet; his hands get blistered with the shovel and his eyes grow dazzled from the resplendent light of the fire. Then comes the additional side duties of taking water, shaking the grates, cleaning the ash-pan, or even the fire, where bad coal is used, filling oil-cans and trimming lamps, to say nothing of polishing and keeping things clean and tidy. By the time all these duties are attended to, the young firemen does not find a great deal of leisure to admire the passing scenery.

A great many idle young fellows, ignorant of railroad affairs, imagine that a fireman's principal work consists of ringing the bell, and showing himself off conspicuously coming into stations. They look upon the business as being of the heroic kind, and strive to get taken on as fireman. If a youth of this kind happens to succeed, and starts out on a run of one hundred and fifty miles with every car a heavy engine will pull stuck on behind, his visions of having reached something easy are quickly dispelled.

Like nearly every other occupation, that of fireman has its drawbacks to counterbalance its advantages; and the drawbacks weigh heaviest during the first ten days. The man who enters the business under the delusion that he can lead a life of semi-idleness must change his views or he will prove a failure; the man who becomes a fireman with a spirit ready and willing to overcome all difficulties, with a cheerful determination to do his duty with all his might, is certain of success, and to such a man the work becomes easy after a few weeks' practice.

Practice combined with intelligent observation gradually makes a man familiar with the best styles of firing, as adapted to all varieties of engines, and he gets to understand intimately all the qualities of coal to be met with, good, bad and indifferent. As his experience widens, his fire management is regulated to accord with the kind of coal on hand, the steaming properties of the engine, the weight of the train, the character of the road and of the weather. Firing, with all the details connected with it, is the central figure of his work, the object of pre-eminent concern; but a good man does not allow this to prevent him from attending regularly and exactly to his remaining routine duties.

There is a familiar adage among railroad men, that a good fireman is certain to make a good engineer, and it rarely fails to come out true. To hear some firemen of three months' standing talk, a stranger might conclude that they knew more about engine running than the oldest engineer in the district. These are not the good firemen. Good firemen learn their own business with the humility born of earnestness, and they do not undertake to instruct others in matter beyond their own knowledge. It is the man who goes into the heart of a subject, who understands how much there is to learn, and is therefore modest in parading his own acquirements, that succeeds.

When a fireman has mastered his duties sufficiently to keep them going smoothly, he begins to find time for watching the operations of the engineer. He notes how the boiler is fed, and upon his knowledge of the engineer's practice in this respect, much of his firing is regulated. The different methods of using the steam by engineers, so that trains can be taken over the road with the least expenditure of coal, is engraven upon the memory of the observant fireman. Many of the acquirements which commend a good fireman for promotion are learned by imperceptible degrees. The knowledge of speed, for instance, which enables a man to tell how fast a train is running on all kinds of track, and under all conditions of weather. There would be no use in one strange to train service going out for a few runs to learn speed. He might learn nearly all other requisites of engine running before he was able to judge within ten miles of how fast the train was going under adverse circumstances. The same may be said of the sound, which indicates how an engine is working. It requires an experienced ear to detect the false note which indicates that something is wrong. Amidst the mingled sounds produced by an engine and train hammering over a steel track, the novice hears nothing but a medley of confused noises, strange and meaningless as are the harmonies of an opera to an untutored savage. But the trained ear of an engineer can distinguish a strange sound amidst all the tumult of thundering exhaust, screaming steam and clashing steel, as readily as an accomplished musician can detect a false note. Upon this ability to detect growing defects which pave the way to disaster, depends much of an engineer's chances of success in his calling This kind of skill is not obtained by a few weeks' industry; it is the gradual accumulation of months and years of patient labor.

I once knew a machine shop foreman, a man of extensive experience in building and repairing engines, take a locomotive out on trial trip. A side rod pin began to run hot, and although he was leaning out of the cab window, he did not observe anything wrong till a drop of babbitt struck him in the eye. An experienced engineer watching the rods would have detected the condition of affairs before babbitt was thrown.

A difficult thing for an inexperienced man to control in running a locomotive at night, when the conditions for adhesion are bad, is the slipping of the drivers. Slipping is a simple matter enough to those who feel it in the vibrations of the engine; but the novice has not this sensitiveness to slipping vibration developed, and he must depend upon his eyesight or his hearing to detect it. On a dark stormy night the eye is useless as a means of judging as to the regularity of the revolving wheels; the howling wind or rain rattling on the cab drown the sound of the exhaust. Under circumstances of this kind, an engine might jerk her pins out before the empirical engineer discovered she was slipping.

As his acquaintance with the handling and ordinary working of the locomotive extends, the aspiring fireman learns all about the packing of glands, and how they should be kept so as to run to the best advantage; he displays an active interest in everything relating to lubrication, from the packing of a box cellar, to the regulating of a rod cup. When the engineer is round keying up rods or doing other necessary work about his engine, the ambitious fireman should give a helping hand, and thereby become familiar with the operations that are likely to be of service when he is required to draw upon his own resources for doing the same work.

Of late years the art of locomotive construction has been so highly developed, the amount of strain and shocks to which each working part is subjected has been so well calculated and provided against, that breakages are really very rare on roads where the motive power is kept in first-class condition. Consequently, firemen gain comparatively small insight, on the road, into the best and quickest methods of disconnecting engines, or of fixing up mishaps promptly, so that a train may not be delayed longer than is absolutely necessary. A fireman must get this information beyond the daily routine of his experience. He must search for the knowledge among those competent to give it. Persistent inquiry among the men posted on these matters; observation amidst machine shop and round-house operations, and careful study of locomotive construction, so that a clear insight into the physiology of the machine may be obtained, will prepare one to meet accidents, armed with the knowledge which vanquishes all difficulties. Reflecting on probable or possible mishaps, and calculating what is best to be done under all contingencies that can be conceived, prepare a man to act promptly when a breakdown occurs.

LETTERS FROM PRACTICAL MEN.

Machine Shop Economy.

Editor American Machinint:

Your recent article on "Costing Machine Work," performs the highest function of an editorial in suggesting thought and starting discussion upon a fundamental topic. Economy in the machine shop is the price of existence. Economy is the strategic point in the narrowing industrial fight between the old world and the new. It is the last of British strongholds. If we carry that, the field is our own. Laxity regarding the minute economical details is, especially in our machine shops, a national weakness. I wish, in this writing, to call attention to a single point of shop management, which while it is the basis of the "costing" process, I do not speak of from that standpoint. I mean the necessity of keeping a strict and detailed account of every man's time. In too many of our manufacturing establishments—I mean in contradistinction to jobbing shops where time must be kept to enable the making out of bills—no such careful record is kept. The necessity of it is not sufficiently appreciated. There is no establishment of whatever size where a timekeeper will not prove, in economic advantage, a necessary and profitable institution. Let every man's time be fully accounted for. Do not tempt the weak. No matter how often a piece of work is done, or who does it, let it be on the record how long it has taken to do it, and, by comparison, how long it should take to do it. I know that the existence of such a record makes a difference. I know something of the operation of it in my personal experience. Let us say that I was, in all respects, an average workman, neither better nor worse, neither slower nor faster than my fellows, yet the fact that my work could at any moment be unerringly compared with that of others proved a spur, and no more than a healthy spur to me, and did much to promote the development of whatever mechanical ability I may possess. I do not mean that the time-book is to be trotted out and debated over as each job occurs. It may probably never be alluded to in the shop; the knowledge of its existence and scrutiny in the office is sufficient. There is nothing in this but simple justice to the workman, certainly nothing of oppression or uncomfortable espionage. If one can do—but *can* is of little account, though some are disappointed because they are not paid for it—if one *does* more than another let it be known; let him have the benefit of it. I am so much in favor of equalizing wages by increasing the pay of the most deserving, that I will do all that I can to promote the means whereby they may be certainly known. If any man is laboring under disadvantages in the way of inferior conveniences or deteriorated tools, let these things be discovered and readjusted to his advantage. If a man is a "sojer," or a beat, or an incompetent, let him be spotted, but don't expect to do it entirely by making a policeman of your foreman. If castings run hard, let it be known how costly they are. If patterns get out of shape and cause trouble, you will be more likely to hear of it where a full time record is kept, and the necessity of accounting for unreasonable delays exists, than where men are allowed to give it in as "contract," or "shop," or "12 x 20," or whatever cloak may be broad enough to cover their multitude of sins. There are plenty still (and I don't blame them, but I don't want them) who envy the fellow who goes about the country repairing church steeples, because no one can measure or find fault with his work. There is a close connection that I will not here try to trace between quick work and good work. They are largely the product of the same conditions. A habitually and reliably quick workman has his tools always sharp, and always of good shape; always ready. He looks ahead and anticipates his needs. If he has a straight cut for half a day, he does not at the end of it have to go and wait for the blacksmith to dress the next tool that the job calls for. The production of good work calls, as much as quick work, for tools well made, well adjusted and well directed. It is the most correct advice possible, which tells the young workman, first of all and far beyond all else, to insist upon doing his work well, assured that speed will inevitably be thus best secured. A strict time record, then, is not merely the means of finding the cost of work; it is a healthy and legitimate stimulant, and has in it the sure promise of an increased and improved product.

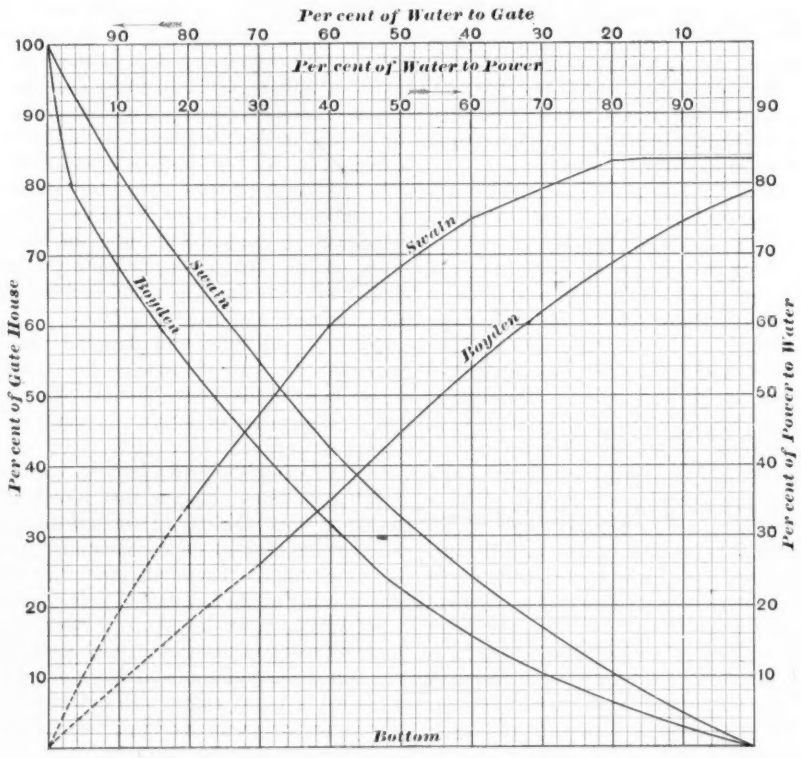
FRANK H. RICHARDS,
Foreman Tolhurst's machine shop, Troy, N.Y.

Water-Wheel Tests.

Editor American Machinist:

Some one has seen fit to attack a communication I sent you in June last, over the signature of "Hydrodynamicus," in your issue of December 23d, and though I usually take no notice of anonymous communications, there are one or two statements in that letter which require an answer.

In the first paragraph, your correspondent says that the lines only indicate the best results of some of the wheels, and the poorest of others. This, so far as I am concerned, is not so. I gave nothing of the sort. I gave, in most cases, the results of tests which I had either made myself or received from good authority, and had reason to believe were correct.


Per cent of Water to Gate
90 80 70 60 50 40 30 20 10
Per cent of Water to Power
10 20 30 40 50 60 70 80 90
Per cent of Gate House
Per cent of Power to Water
Swain
Boyden
Swain
Boyden
Bottom

In the diagram of wheels with "unbroken water passages" I erroneously included the "Hercules," omitting to state that I did so because there were flanges, or adjutages, formed on the buckets of the wheel itself, so as to keep the water from spreading after it passed the gate. All the tests on my first diagram were my own, except those of the Swain and Leffel wheels. The Swain was taken from Mr. Francis, the Leffel from the best average I could get from the tests of Mr. Emerson.

In my second diagram, the Hunt, Victor, and Houston are mine, and the Boyden is from Mr. Francis. The Ames-Boyden was sent me from Chicopee, where the test was made, and is much better than some reported by Mr. Emerson.

In your correspondent's "Diagram D," he confesses to omitting the tests of the Tyler, Tait, and Success, which were important, "for the sake of perspicuity," as he says, and makes it more perspicuous by adding a lot of lines which I know nothing about, and doubt much if he does.

Further than this, he omits the line of the Risdon wheel, which ran about 2 per cent. above the Swain, but does not say so, and puts in a line he calls "Risdon," running from 78 per cent. down to 30 per cent., which I do not believe was ever taken from any "Risdon wheel," built by Mr. Risdon since 1876. He, however, says that "the Risdon turbine would no doubt show similar high discharge lines with the Swain, as shown on diagram, if plotted from the proper data." Why then did he omit the very thing from the diagram when it was plotted from data obtained by a triplicate test?

Finally, he says: "To theorize, then experiment solely to prove the truth of the theory, is a long way to the truth." If he intends to apply these remarks to me, I must say I never made a test to prove a theory in my life, and all the theories I have ever formed have solely been the results of experiments I have been called on to make for entirely different purposes.

If "Hydrodynamicus," or any one else, has anything to say to me which shall cause me to change my opinions, I shall be very glad to hear it, over his own name, but shall take no farther notice of it if he gets behind anonymous signatures.

As the article of December 24th, to which I refer, contains a diagram of the discharge of water in proportion to gate opening, which differs entirely from any facts in my possession, I send you one of the discharge of water in proportion to gate opening, and the per cent. of power realized in proportion to water used, both taken from Mr. Francis' tests of the Boyden wheel at the Tremont Mills, and the Swain wheel at the Boott Mills, which, I take it, your correspondent will not dispute.

SAMUEL WEBBER.

Indicator Rigs.

Editor American Machinist:

In your issue of Jan. 20, your correspondent "M. C. R.," writes with reference to his "Adjustable Indicator Rig:" "The motion of the drum will be identical with that of the piston, only reduced to the size of card wanted." If by "identical," is meant that piston positions are represented by corresponding positions on a reduced scale on the card, the statement is not correct. The piston positions for the various positions of the crank are governed by the proportion between the lengths of the connecting rod and crank, while the card will represent, very nearly, crank positions. Quite an important difference for some purposes.

While on this subject, R. Grimshaw, in his article "Variable Indicator Rigs," in the AMERICAN MACHINIST of Dec. 30, represents the short lever at the top (he also mentions it in the text) at right angles with the long lever when the crosshead is at half stroke. This would make the short lever vibrate entirely below the horizontal line, and would seem to needlessly intensify the error due to that form of connection. Why should not the connection be so made that the vibration of the short lever is equally above and below the horizontal line? INDICATOR.

The Long and the Short of the Journal Question.

Editor American Machinist:

Allow me here to express my thanks to several of your correspondents, who have in their letters shown kindly appreciation of views upon lathes, spindles, &c. Two or three of them, however (among them Mr. Oakley S. Walker, in your last issue), seem to have misunderstood me, to the dreadful extent of thinking that I favor *short* journals! Heaven forbid! I have always been radical in favor of ultra long journals, and my practice has been to make ordinary shafting bearings, &c., of a length four times or more their diameter. Of course this could not well be carried on with the enormous diameters advocated in my article that you published December 9, 1882, as it would give a journal 30″ long! It will, however, be seen that I there recommended the right and left journals ("back" and "front," some people call them) of a 20″ lathe to be 3¾″ and 7½″ long, respectively. Now, the average lengths of journals, taken at random, from four fairly good modern lathes, I find to be 2¾″ and 4″. Mine may be too short, but are certainly longer than most if not all now in the market. Still longer would be better if there was plenty of room, but the lengths given would insure considerable durability—the object sought. OBERLIN SMITH.

Bridgeton, N. J.

The Abuse of Tool-Post Wrenches.

Editor American Machinist:

I think of getting up a patent tool-post wrench and hammer combined. How do you think it would pay? Why is it that men that can really do a first-class job will persist in screwing a tool down hard in the tool-post, and then snatch off the wrench and hit the tool two or three sharp raps to bring it round in a position to suit them? I am working at the present time in a shop where if a man should make a practice of laying his work or tools on the shears of the lathe, he would be told his services were not needed, which is all right. But the foreman will stand beside a man and see him knock a lathe tool round with the wrench and not say a word, or even appear to notice it. Why in the name of common sense cannot a man set a tool right at once, by screwing it down solidly and not marring and bruising a wrench all out of shape by using it for a hammer? J. E. WILSON.

V's and Flat Ways for Engine Lathes.

Editor American Machinist:

The proof of the fact that the raised way system on engine lathes has not yet been fully developed, is shown in the many different styles, shapes and proportions of lathe carriage guides found on our machine tools. The round-top way, the acute angled V, and the obtuse angled V, with various length and breadth of carriage bearing, are seen, and there are still not wanting reformers who would discard raised ways altogether, and substitute flat ways, and let the outside of the lathe bed form the lateral guide for the carriage.

The advantages claimed for the flat way over the V way system may be briefly summed up as follows: First, greater stiffness of carriage, consequent upon its inability to lift from its bearing on the lathe bed; second, greater wearing surface, and consequently a more durable alignment; third, an advantage of diminished deviation from alignment, due to the same amount of surface wear upon the flat way as compared to the V way.

Granting that it is not practicable to make and maintain a perfect bearing, both on the V and beneath it, for the gib, I will assert that a well-fitting carriage cannot be maintained on the flat gibbed ways, because of less wearing surface for the gibs, as compared to the surface on top of the flat ways, and because of the lever action of the feed, consequent upon the lateral guides for the carriage being so far apart. The advantage of greater wearing surface attainable with flat ways, cannot be claimed if we enlarge our obtuse angled V's to sensible dimensions.

The most hair-splitting of all the advan-

tages claimed for flat ways is the third one. The writer, a few years ago, was engaged in Leeds, England, and was running an imported "Yankee" lathe, when one day he was visited by an English engineer, who, after examining the lathe very carefully, began to talk of the superiority of English lathes, especially in regard to their flat carriage guides. He argued in favor of English tools and flat ways, and proceeded to demonstrate that, with a V of 90°, for instance, the wear of a certain amount of surface dropped the carriage more than the same surface wear on a flat way, or, representing the depth of surface wear by 1, the deviation from alignment of the carriage moving on the V ways would be represented by $\sqrt{2}$, while the other, of course, would be represented by 1. The writer claims no credit for powers of argument, but rather claims the credit due the excellency of the tool, when he says that the same engineer afterwards ordered a similar lathe, and was much pleased with it.

Let me say right here, to anyone that is inclined to believe in the heresy of English superiority in the line of machine tools, that he is likely to find himself mistaken when he has practical experience with them. But this is a digression.

Having committed myself in favor of Vs, I will state my ideas as to the best practice in proportioning and making them.

I contend that the *front* V should be the only guide for the lathe carriage, and that it should be at least twice the size of those found on the standard lathes at present The second V, on the front of the lathe, may be left off entirely, that the chips and grit may be frequently and easily brushed off. The back side of the lathe should have one smaller than the front one, for the alignment of the head and tail stocks, and the back side of the carriage may slide on a flat surface, and be gibbed or weighted at the back. I am in favor of making the carriage bearings extra long, and letting the carriage be heavy enough to need no weighting.

The advantages of this style of ways may be briefly stated as follows: The large front V, forming at once the top and lateral guide for the carriage, and near the point of feed propulsion, causes the carriage to move easily and strongly, and the V being raised so much will not get covered with chips and grit to so great a degree. The advantage of having the second way flat has already been spoken of, and if one V is sufficient for the carriage, it is sufficient for the head and tail stocks.

The lead screw should be on the front side of the lathe, and should be splined and used for the feed-rod also, as is the practice with our best tool makers at present.

There are many little points about the engine lathe that are not apparent to the casual observer, but which would fill volumes if fully discussed. O. S. WALKER.

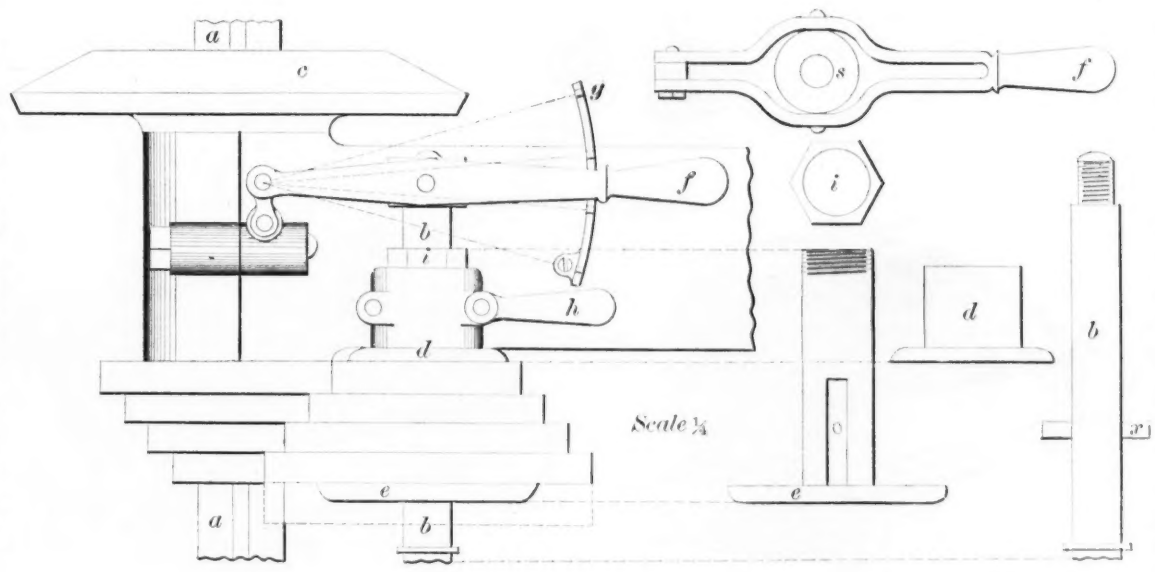
Watertown, N. Y.

Cone Gears vs. Cone Pulleys.

Editor American Machinist:

The annexed delineation represents a system of cone gears as applied to the feeding device of an upright drilling machine instead of the usual cone pulleys and belt. There are different methods of arranging systems of gears for the purpose of changing speed, but I think the present system the best I have ever seen. A pair of cone pulleys and a belt is no doubt the most simple and least expensive, but the gear system has the advantage of being much the handiest, the most compact and positive. The sketch shows a portion of an upright drilling machine of the usual construction; *a*, the drill spindle, *b*, the feed spindle, each carrying a cone of four gears, as shown; the cone upon the drill spindle is permanently fixed to the hub of the main gear, *c*, but the gears composing the cone upon the feed spindle work independently of each other between the flanges *d* and *e*, the lower flange *e*, being upon the quill which carries the gears, and the upper flange, *d*, upon the box in which the quill works. See details. The feed spindle passes through the quill, of course, as shown, and carries upon its lower end, the usual worm (not shown), through which the spindle slides on a spline.

Change of speed is effected by a slight lengthwise movement of the spindle *b*, by means of the handle *f*, the handle being held in the desired position by notches seen in the arc *g*. When the handle is at either of the intermediate positions between these notches, the spindle is at rest, hence all of the changes of speed may be made while the drill is in motion without danger of engaging two gears at the same time. This last feature is not characteristic of all systems of speed gears; some of them require the machine to be at rest when the change is made. By loosing the clamp nut, *h*, the cone upon the feed spindle may be droped bodily out of gear. F. G. WOODWARD.



Notes on Lathe Construction and Use.

Editor American Machinist:

Half a century ago the only manufacturers of conical-necked lathe spindles in Britain were Bodmer & Whitworth.

Now, in English practice, for small and medium-sized lathes, the taper journals seem to be almost universal. Bodmer's plan was to have the live spindle of hardened cast steel. The journal was ground with a pulley, or wheel with a copper rim, attached to the slide rest, and emery was applied as it traversed across the journal until the latter was dead true. The back end of the spindle has a loose steel taper cone, with two jam-nuts for adjustment, and the usual steel hardened tail-pin against the end of the spindle, to prevent friction and unnecessary pressure against the front taper journal. When a lathe spindle is accurately fitted up in that way, and well taken care of, it never gets out of line with the ways or the dead spindle of the tail-stock.

In many Western shops no time is allowed for repairs, and durability ought to be looked to as well as other things.

One of your correspondents objects to lathes constructed on the "Hercules" principle, and advocates closer forging. He is correct in one sense. The English railway shops want first-class, close forging. A blacksmith from Swindon informed me that his work was weighed pound for pound, and booked monthly. They claim that the best of the stuff is on the outside, and the extra time that is spent in the smith's shop is gained in the machine shop. This is the reverse of the practice in some locomotive works in this country, where rough forging is the rule, and the practice is to cut many things out of the solid. By the latter system they claim that less experienced and cheaper blacksmiths can do the work.

If a broad, flat tool can be used on a heavy planing machine without chattering, why not on a heavy chuck lathe? Special lathes are required for special work, the same as lightning express locomotives and freight engines. All shops ought to be provided with special polishing lathes; also single-speeded hand lathes for scraping cast iron and hand-tooling light work of irregular form. It ruins a good engine slide lathe to run for hours on the quickest single speed.

It is poor policy to forge too close on heavy marine work, say on wrought iron shafts from 10" to 20" diameter. I have had great trouble in former days on that account, with crooked propeller shafts having to be straightened at a great expense and loss of time. It takes no longer to tool off a half-inch than one-eighth of an inch.

The lathe represented in your issue of Jan. 6th, by Mr. Reed, of Cairo, Ill, has some very good points. "Strong enough for the heaviest work done on a lathe of its size, and at the same time easily handled in doing lighter work." Such a lathe, if the shears were made strong enough, with a sliding gap, would be large enough for anything about a locomotive except the drivers.

That English lathe of Astbury & Dawson has some peculiar features. The long boss on the center end of the tail-stock, which I advocated in a previous issue, for one. The immense size of the leading screw, and the gap in the shears, to be used open or closed, are unusual in this country.

It has the usual taper journals, and no boxes or binding screws. The handles and cranks look as if they had been hastily made in the blacksmith shop. The carriage is gibbed on both sides—the universal English practice—and the tail-stock can not be set over; another English feature that will find little favor in this country. The tools are held by clamps and bolts, and the compound rest is always attached there. The gear feed is simple and accessible. The shears, like all English and Scotch lathes, are flat. The fast head-stock is the right shape to allow a large gear and cone. All English pulleys and cones are crowned with a gradual curve. American pulleys are generally a straight taper. The reason for this probably is, England is an old country and pulleys were generally roughed out and scraped by hand before slide lathes came into general use. Hand lathe work was never practiced to the same extent in this country. It would be difficult in England to find a turner forty years old that could not turn a pulley or shaft by hand, or chase a thread out of the solid. It is all done away with in most shops there now.

Notwithstanding the prejudice that exists against hand tools and against men who know how to use them, I have found learning to use them when I was a boy has stood me in good stead in this country, particularly on work of irregular form, whether on brass, steel, wrought or cast iron. A man that can only tend a tool going in straight lines and has to make a liberal use of a file on balls, handles, &c., is nowhere against a hand turner. J. K. C.

Ft. Wayne, Ind.

Iowa built the most railroad of any State during 1882, with Texas next, New York third, and Ohio fourth.

The *London Iron Journal* states that a new system of melting iron and at the same time incorporating in it scrap, wrought iron, etc., has been invented by Herr Ibruegger, a well known engineer, who has built one furnace at the Michelbacher Huette, at Michelbach, and another at the works of Julius Meyer & Co., at Norden. The cupola is supplied with blast through two sets of tuyeres, one above the other, there being eighteen in each set. The tuyeres or ports, which have the form of a vertical slat, are directly connected with a circular tuyere ring. The particular feature of the cupola is that the bottom is a slightly inverted arch, which is pierced by two openings through which both blasts or rather imperfectly consumed gases of combustion, and the fluid iron can flow. Below is a small chamber in which the iron collects. It is heated by the gases forced downward from the cupola above, which are supplied with the necessary air for combustion by a special tuyere leading from the main blast pipe. The chamber at the same time serves for preheating scrap, etc., which need only be pushed into the bath for dissolving it. Of course, it is well known that considerable quantities of scrap can be used by directly charging in ordinary cupola; but it is claimed that in this case there is economy of fuel and a greater facility in making sharp, strong castings and a purer metal. The best iron for this is said to be inferior pig, like No. 3, Middlesborough, holding considerable silicon and little manganese. To it from 40 to 50 per cent. of scrap, etc., may be added. The total consumption of fuel is stated to be 10 per cent. of the weight of the product.

Expert testimony goes to show, says the *Railway Age*, that low temperature has but little to do with the breaking of engine tires. Tests, it is claimed, have demonstrated that, other things being equal, the tires are as strong in severe frosts as when the temperature is normal; but low temperature, increases, of course, the rigidity of the road and its inequalities, and so renders the shocks received by the tires very violent, producing at times disasters which are attributed to changes in the metal.

The New Aluminum Process.

The new process of extracting aluminum or (using the British spelling) aluminium, has excited a great deal of interest. The *Ironmonger*, of London, give some particulars of the discovery, from which we make the following extract:

"The Aluminum Crown Metal Works Company, at Hollywood, near Birmingham, now claim to have invented and perfected a process by which, taking alum as the source, they can produce any quantity of pure alumina, which is afterwards, converted into chloride of alumina, from which in turn the metal is extracted by the ordinary process of fusion with sodium. By this process the two impurities of aluminum—iron and silica—are got rid of. The author and patentee of this valuable invention is Mr. James Webster, the founder and principal of the Aluminum Company. A French syndicate has just offered over £250,000 for the patent for France alone, while companies in the United States are proposing even larger sums to acquire the right of manufacture in the States. Scarcely less eagerness is displayed by the Belgians and Germans to purchase the rights for their respective countries, but the arrangements are not yet completed. The invention has only been perfected about eighteen months, and the firm have but recently begun to place the product on the market; yet such is the demand that, though they are now working day and night, they cannot execute one-twentieth part of the orders that are accumulating on their books. By the ordinary method of precipitation 12 tons of alum and 6 tons of carbonate of potash, soda or ammonia are required to produce 1 ton of alumina, and the whole process occupies nine months; whereas, in Mr. Webster's plan no precipi-

tant is used, and a ton can be manufactured in a week with the existing plant at Hollywood. The cost of producing a ton of alumina by the ordinary methods is upward of £1,000, while it is less than £100 by Mr. Webster's process. Mr. Webster's process for the manufacture of alumina is to take a given quantity of alum and pitch, which are first finely ground, then mixed together and placed in a calcining furnace, by which means 38 per cent. of water is driven out, leaving the sulphur, potash and alumina with oxide of iron. The calcined mixture is then put into vertical retorts, and steam and air are forced through, which leaves a residue of potash and alumina only. This residue is afterward placed in a vat filled with warm water, which is heated with steam. The potash is thus withdrawn, and the alumina left as a deposit in a very condensed state. The potash liquor is then run off, boiled down, while the alumina precipitate is collected in sacks and dried. It is then ready for making chloride of alumina. The alumina deposit thus obtained contains about 84 per cent. of pure alumina, while that which is obtained by the old process of percipitation has only 65 per cent. Thus there is not oniy a saving of nine-tenths in the cost, but a gain of 19 per cent. of alumina over the method of precipitation. In addition, Mr. Webster recovers the whole of the bye-products, consisting of potash, sulphur—which is utilized for making sulphuric acid—and the illuminate of iron. From these bye-products is made a blue dye, which is sold for 6s. per pound, and is used in the place of indigo for dyeing calico and other material. In order to complete the process, and convert it into aluminum, the chloride of alumina is treated with sodium in order to withdraw the metal."

If the above statement shall prove to be made up of actual facts, the discovery is one of surpassing importance.

Stiles' Letter Copying Bath.

In copying letters, one of the principal difficulties encountered is in attempting to moisten the paper uniformly.

If the brush which is generally used contains too much water, a miserably blotted copy is the result of an effort to secure a copy, besides which the original letter is more or less damaged. If the copying paper has been unevenly moistened, or has not received the requisite quantity of water, the copy must necessarily be pale and unsatisfactory. It will, therefore, be generally admitted that to copy letters satisfactorily a uniformly moistened sheet of copying paper is indispensable. Various attempts have been made to accomplish this end, but most of them have been unsatisfactory. The apparatus shown in the accompanying engraving was designed for dampening cloths uniformly, to be used instead of applying water directly to the leaves of the copying book with a sponge or brush.

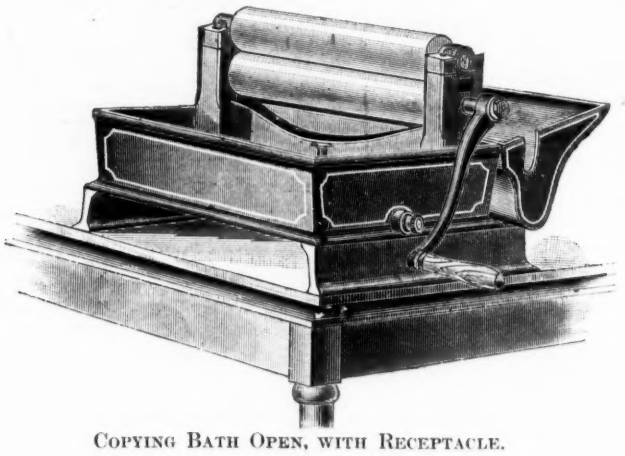
This apparatus consists of a cast-iron tank or box, to hold the water, enameled upon the inside. Within this box are two rollers similar to those used upon the ordinary clothes-wringer, with a spring underneath for pressing the rollers together. Motion is communicated to these rollers by means of a crank. The box is japanned and ornamented upon the outside, and is provided with a cover to protect the interior from dust and dirt when not in use.

When open for use, the cover forms a receptacle for the cloths as they are passed through the wringer. The cloths are kept in the water when not in use, and are thus kept in constant readiness for use.

When letters are to be copied, as many cloths are wrung out as there are letters to be copied. These cloths are to be placed opposite the letters in the copying book, then placed under a press, and pressure applied in the usual way.

In this way as many as forty letters can be copied at one time. One cloth can be made to answer for every two separate letters, and being thin, these cloths occupy but little space in the book. In removing the cloths from the book, they should be folded once, so that they may lie flat in the bath and pass smoothly between the rolls. The bath is to be kept half full of water, which should be renewed often enough to keep it fresh. These baths are furnished either with receptacle underneath for letter-book, or without, as may be desired, by the Stiles and Parker Press Co., Middletown, Conn.

COPYING BATH CLOSED, WITHOUT RECEPTACLE.



COPYING BATH OPEN, WITH RECEPTACLE.

We have received quite a number of neat and tasteful calendars for 1883. Among them is one from the Concord Axle Works, Concord, N. H.; one from L. B. Flanders Machine Works, Philadelphia, one from the Valley Iron Works, Williamsport, Pa.; one from the Lehigh Valley Emery Wheel Co., Lehighton, Pa., and several from fire insurance companies and stationers.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE AMERICAN MACHINIST.

Continued from last week.

Frick & Company (Steam Engines, Saw Mills, Separators, etc.), Waynesboro, Franklin County, Pa., write us:

The year 1882 was a busy year for us, being unable, as in preceding years, to supply the ever increasing demand for our machinery. At the beginning of 1882 we increased our capital stock from $350,000 to $600,000. During the year we added new buildings, new working machinery and new tools, wages of skilled mechanics were advanced; employed over five hundred workmen per month, and worked a considerable night force by electric light.

The most noteworthy features of the past year were that the orders were far in advance of our ability to supply promptly, yet our manufactures for the year amounted to nearly a million dollars' worth. We also remodelled the Eclipse Traction Engine, producing, we confidently believe, the best now before the public; and, in exhibiting the same at the St. Louis State Fair, in October, we were awarded the $100 premium over fourteen others in competition. Our capital is now raised to $900,000, and we predict that the business for 1883 will equal, if not exceed, the prosperity of the past year.

The Davidson Improved Steam Pump Co., Brooklyn, N. Y., write us:

The year 1882 has been to us one of very gratifying success, and the outlook from our order-book is also very gratifying. We are now busy setting up and testing, as fast as we can complete them, a 15,000,000-gallon compound condensing, high-service pumping engine for our own city; one of same character and service of 6,000,000 gallons for Fall River, Mass.; one of 3,000,000 gallons for Knoxville, Tenn., and two of 4,000,000 gallons each for the Lake Superior district, and twenty-eight of smaller dimensions and requirements for Government use on the Mississippi River improvement (none, however, of less than 1,000,000-gallon capacity), besides a full quarto of orders for our regular styles and sizes. In fact, we are well pleased with our last year's output and the prospects ahead of us. We think it would be both interesting and edifying to the public to know who make the best steam pumps, and, as we think we do, we have to request that you call attention to our desire to meet any or all of our competitors in a public test of any character, and before any board of selected competent experts.

The Hancock Inspirator Co. (Inspirators and General Jet Apparatus), Boston, Mass., write us:

We sold about 15,000 inspirators in 1882, as against 10,000 in 1881. We have added a few good tools during the year, but are cramped for room in our present quarters. The prospect for 1883 is very bright.

The Hewes & Phillips Machine Works, Newark, N. J., write us:

Our output for the year just closed has been both large and satisfactory. We have very much reduced our lines of manufacture, now making a specialty of heavy machine tools and the Allen High Speed Engine. In the former line we have turned out a planer to plane 9 feet square and 25 feet in length, with 4 heads, several 60″ square by 18 feet planers, and a large number of smaller size tools, such as slotters, shapers and gear cutters. We are now constructing a planer to plane 10 feet square by 25 feet in length, to weigh about 80 tons. Also a 54″ stroke slotting machine for slotting heavy forgings; the machine will weigh about 25 tons. We have also had a large demand for our Allen High Speed Engine. We recently shipped one of 300 H. P. to the Pennsylvania Steel Co., also a pair of 150 H. P. each, engines coupled, to the U. S. Electric Light Co.; also a large number of smaller engines to different sections of the country. We observe a general tendency to a reduction in demand for all classes of machinery, but have not experienced any slackness ourselves, running our full complement of men full time.

The Pond Engineering Co. (Engineers and Contractors), St. Louis, Mo., write us:

Our business increased fully one-third (⅓) last year (1882) over that of 1881.

The prospects we consider were never better in the West than at the present time for a good legitimate business year during 1883. In this city the building permits amounted last year to over five and one-half (5½) millions of dollars, and the prospects are, that this amount will be nearly doubled during 1883. St. Louis is growing faster than it was ever known to do before.

The Knowles Steam Pump Works, Boston, Mass., write us:

We have every reason to feel gratified with the business of the past year. In the production of our regular line of machines we have been as busy as ever, while there has been a steadily increasing demand for our several specialties. In order to facilitate the work, we have been obliged to make a large addition to our iron foundry and build a new brass foundry.

These, with the addition of several new tools, leave us in good condition to meet the demands of the present year's business, the prospect for which we have every reason to consider good.

The Geo. F. Blake Mfg. Co., Boston, Mass., write us:

Since the first of last January our business has been excellent and steadily increasing, so that we have found it necessary to add many new tools and new hands to run them. Our water-works business, which constitutes our heaviest class of work, has increased in a manner very gratifying to us; and besides our regular line of boiler feed, fire and mining pumps, our several other specialties have kept pace with the heavier work. We have more than the average number of orders on our books, and consider the prospects for 1883 very flattering.

E. W. Bliss (Presses, Special Machine Dies, Machine Tools, etc.), Brooklyn, N. Y., writes us:

My business the past year has been all that I could ask, fully realizing expectations. At the present date there is not the same urgent demand that existed a year ago, but the prospect for a healthy and increasing business is, in my opinion, good. I am just completing a new 3-story brick building fronting on Adams street, 25 feet front by 80 feet deep. This, when finished, I shall use for my office and draughting rooms. The removal of these departments from factory building will permit a considerable extension of the manufacturing department, and make room for new machinery in view or in preparation.

Grant & Bogert (Machine Tools), Flushing, N. Y., write us:

Our business during the year 1882 has been all that we could ask for, inasmuch as we have had all that we could do, and the prospects for the year 1883 are very bright. We have added to our facilities in the foundry and machine departments, and by so doing hope to give our patrons less cause to complain of our keeping them waiting too long before filling their orders. We have now orders on 14″ and 26″ engine lathes, extending four months into 1883. We employ 90 men, and wages remain about the same as a year ago.

C. W. Le Count (Lathe Dogs, Machinists' Clamps, &c.), South Norwalk, Conn., writes us:

My business has been very good for the past year, and promises well for the year 1883. I have during the year sold most of my old tools, and replaced them with new. Have a new engine and boiler, and am now able to fill orders as soon as received. I have improved my goods, but have not raised prices. I am now getting out a new catalogue, with some new tools added.

The Gage Machine Works, Waterford, N. Y., write us:

We are still busy, and while we have not so many orders ahead of us as during the last spring and summer, are now working on orders, and find no difficulty in making sales for quick delivery. We have during the year made all our patterns heavier, and are now making lathes from new patterns, 25″ swing with 3½x6″ bearing in forward box, and cones for 3½″ belt. Are anticipating a good trade.

Watts, Campbell & Co. (Steam Engines and Machinery), Newark, N. J., write us:

As to our prospects for business, would say that it is *good*. We are very busy and are in constant receipt of orders. Have received orders for several engines since the 1st inst. We are largely engaged in making engines fitted with "Corliss valves," and have inquiries for them from all parts of the country. Last year we turned out more work than any preceding year, and the prospects are that we will do more the present year. We have increased our facilities fully 50 per cent. within the past year, but will have to run our works nights in order to complete our contracts in time, and have put in 15 Weston electric lights for that purpose.

Dean Bros. Steam Pump Works, Indianapolis, Ind., write us:

Our business last year was larger than in any previous year. We are still busy, and consider the prospects good. The greatest danger to business now is unwise reduction of tariff duties.

James Aitchison (Turret Lathes, etc.), Cleveland, O., writes us:

As to machine trade in this city, it has been very slow for several months, but at the present time looks very favorable as far as I am concerned. I have been but a short time in business—a little over two years. Starting with less than nothing ($500 in debt), I have kept struggling along until I am out of debt, and have over $5,000 worth of stock and tools on hand, all paid for. I have seven turret lathes on hand all ready for delivery, with several machines for customers.

The Hartford Engineering Company, Hartford, Conn., write us:

This company has now its full complement of tools, except a 98″ lathe we are building. We are in a condition to produce a large amount of first-class work—our specialty. We are full in all departments. Our engine trade is good. We do considerable job work, and are building a number of special machines to order. Altogether, we are well satisfied with our business. The prospects for the coming year are excellent, judging from the inquiries for engines and other work offering.

We have no time to worry about the tariff or other bugbears, but do fear we won't get our usual vacation this summer.

The Ferracute Machine Company (Presses and Fruit Can Tools) Bridgeton, N. J., write us:

Our business is steadily increasing as evidenced by an average in our machine shop (exclusive of foundry) of 66 hands employed in 1882, against 55 in 1881, 41 in 1880, and 29 in 1879. We have designed and built more new machines in 1882 than in any previous year, and have paid our hands higher wages, the increased expense in this direction being more than met by the addition of special machinery and systematic division of labor.

Among the recent additions to our plant are a Morgan, Williams & Co.'s Steam Hammer, Putnam Drill, Gray Screw Machine, &c. A 36" drill press of English make is daily expected. We have lately designed and constructed for our own use, some very heavy 20" lathes, adapted especially for round dies and other chuck work. Their performance exceeds our best expectations.

We have now in the printer's hands a catalogue of presses, dies, spinning lathes, &c., under date of January 1, 1883, larger and more complete than anything we have yet published. Its contents will include descriptions of seventy-five presses, many of which are illustrated with new cuts showing latest improvements.

The year 1883 opens with a number of orders booked, and a prospect of more in the immediate future.

Clem & Morse (Elevators), Philadelphia, Pa., write us:

The closing year has been the most prosperous our business has ever known, but we attribute this fact largely to the superiority given our elevators by the introduction of the Albro-Hindley Screw and the Pneumatic Safety Clutch, as we hear complaints of great dulness in some lines of business, and have recently employed a number of men laid off by other manufacturers in our line. We have more orders on hand than at this time last year, notwithstanding our capacity of production has been increased fully 20 per cent., the most recent additions being a new forge, lathe, drill press, band saw, sticking machine, and another machine for cutting Albro-Hindley screw gearing for all purposes up to 8 ft. diameter, 6 inch pitch. We are also building another machine to cut the smallest sizes, as we have so thoroughly proven the superiority of the Albro-Hindley over the straight worm, or screw, by its use in our best elevators, that it is rapidly growing in favor and being demanded for other purposes.

We find no difficulty in obtaining machinists and carpenters at moderate wages—just to both employer and employe—but there is always a scarcity of first class millwrights. From the number of inquiries being received from all sections of the country we do not anticipate any serious business disturbance, although there are undoubtedly misgivings in the minds of many, owing to the change in the political management of government affairs, and agitation of the tariff.

The Abendroth & Root Manufacturing Co., 28 Cliff street, New York, write us:

Our business for the current year (1882) shows a marked improvement over last. Our business in Spiral Riveted Sheet Iron Pipe has increased 50 per cent. We have added two machines to our plant, and are constructing two more which we hope to have in operation early in 1883.

From present appearances we shall hardly be able to keep pace with our orders, even with our increased facilities.

Among the many improvements we have made during the past year, one of the most important is that of making our black riveted hydraulic pipe perfectly tight up to its bursting pressure; we are now manufacturing it from 3" to 24" in dameter, and can confidently recommend it for almost all purposes for which cast or wrought iron pipe is used, except gas and live steam.

Our foreign trade promises well and gives indications of rapid extension, particularly in the direction of Mexico, Cuba, Central and South America and Australia. The demand from these countries seems principally to be for mining purposes, though much has been bought for other uses.

New appliances and methods recently adopted, enable us to manufacture a perfectly tight hydraulic pipe strong enough to meet any practical requirements as to the head or pressure up to 600 or 800 feet, according to gauge and diameter.

For protection against rust and decay when laid in the ground, we dip it in a mixture of coal tar, asphalt and other ingredients at temperature of from 300° to 350°. In the majority of water works now in operation on the Pacific coast and in the far West, sheet iron pipe with a longitudinal riveted screw is used and thus protected; the experience of the past 20 to 25 years has proved its success and value.

Our business in the Root Wrought Iron Sectional Safety Boiler has been prosperous and encouraging. Our trade, both foreign and domestic, has increased fully 33⅓ per cent.; orders have taxed our facilities to the utmost and we carry some over into 1883.

Charles E. Lipe (Milling Machines, etc.), Syracuse, N. Y., writes us:

My business during 1882 developed largely in excess of what I predicted for it at the beginning of the year. I am in pressing need of more shop-room, and am looking for a suitable site with the view of building.

Our steam broom machinery is gaining a strong foothold among broom manufacturers, this year's sales having been larger than any previous year, including shipments to several foreign countries.

The Universal Milling Machine, brought out during the year, has met with fair success, and promises to develop into a good business. I intend shortly to bring out a smaller size for tool-room requirements and lighter work. I look for a continued increase of business for 1883.

Wm. T. Bate & Son (Iron Founders, Boiler Makers and Machinists), East Conshohocken, Pa., write us:

Our business progress during 1882 was very good, and we have put in more of our patent boilers during 1882 than at any previous year.

As to the prospects of this year, we believe they will not be as good as last year, although we are full of orders at the present time. The new line of the Pennsylvania Railroad Company sweeps right through the center of our works. The property is bonded, and it is very likely that we shall have to leave for other quarters very soon, as the surveyors have been at work here the past week. We have not decided as yet where we will locate our works, although we have had two or three offers of ground.

Murrill & Keizer (Machinists and Manufacturers), Baltimore, Md., write us:

We are pleased to say that business has been on steady increase with us since first established in 1864, with the exception of the dull times during the panic of 1873, at which time we were quartered in our old place, No. 44 N. Holliday street. Feeling the pressing need of greatly increased room, we were forced to seek the place we now occupy since March last, Nos. 28, 30 and 32 N. Holliday street, one block from the City Hall, which place we built to best suit our business. The building is 75 feet front by 72 feet deep, six stories, including basement, which we occupy as an engine-room and blacksmith shop. We are now employing our full force of hands, and have no room to complain. During the past year we have added several improved tools of greater capacity to our stock. We are engaged in the general machine business, and manufacture a number of specialties, among which we might mention the guard patent brick machine and press, Murrill & Keizer's patent damper regulator for steam boilers, Painters' patent gauge cock, odorless excavating machinery, tinners' presses, dies and machinery, including all kinds of new and experimental work.

J. M. Badger (Commission Machinery), 5 Dey street, New York, writes us:

Although having but recently started in business here, I can say that I feel highly gratified at the results of the past few months, and have every reason to believe that the coming year will be one of prosperity to both builders and users of machinery.

The inquiries from all parts of the country for tools, for delivery early in the year, are from substantial and careful buyers, many of whom want only "first class," and very frequently those of the heavier grades.

The Elmira Steam Engine Co., Elmira, N. Y., write us:

Although our product (automatic lubricators) was only placed upon the market last September, the demand has exceeded our expectations. Inquiries and orders are coming from all portions of the country.

We shall double our capacity as soon as possible, and, if required, work extra time. Judging from the present and our limited experience of the past, the look for 1883 is favorable.

The Rollstone Machine Company (Wood-Working Machinery), Fitchburg, Mass., write us:

Our business has been good the past year—in fact, booming—so we have had to increase our force and then work overtime. There has been no time but we have had all the orders we could fill, and the prospects for the year 1883 are more than bright, as there has been no time the past three years we have had as many calls for our products through the holiday season as this year. What there is in store for us we are unable to say; but, by a continued effort on our part to place strictly first-class goods upon the market, we hope to merit our share of patronage, and trust all may be favored with a prosperous and happy new year.

H. W. Johns Manufacturing Co. (Asbestos Materials), 87 Maiden Lane, New York, write us:

Our business for the year 1882 has been, in every branch, largely in excess of any previous year.

In paints for structural purposes the increase is about 40 per cent.; in asbestos steam packing, boiler coverings, building felt, etc., over 50 per cent.; in roofing materials, 35 per cent.; and a relative increase in other goods of our manufacture.

We anticipate a similar increase for 1883.

We have added more than 26,000 square feet of floor space to our factory during the year; and, in order to meet the increased demand, have put in an additional engine (200 horse power), a third boiler, and have also added largely to our different lines of machinery.

Prices will probably remain about the same, though labor is costing a little more, and there has been an advance in some raw materials.

The main increase in our business is in our domestic trade, though we have exported probably 50 per cent. more goods than any previous year.

The M. C. Bullock Mfg. Co., Chicago, Ill., write us:

In looking back over the year 1882 our business has been steadily increasing, and we have found our present shops so crowded that the company decided to secure land and build a large and well appointed foundry and machine works. Real estate to the amount of 868×126 feet was purchased, and we are about moving into the first building, which is less than one-half of the contemplated machine shop, it being two story, attic and basement. Ceiling of first floor 20 feet, second floor 16 feet. Dimension of building 166½ ft. long, with L part 66 feet long;—all 60 ft. wide, smith shop 40x60; pattern shop 40x60; out building, containing wash and coat room, paint room and water closet, one story 30x36. It is the intention in the spring to put up the foundry 60x126 with L part 60x60 and cleaning house 60x60, and add boiler shop 60x150 later. It is our intention in addition to our specialties of the Bullock Diamond Pointed Rock Drill, and Straight Line Engine, to enter extensively into the manufacture of all classes of mining and general machinery, and large steam engines. Labor and material have not materially changed.

Hill, Clarke & Co. (Machinery), 36 & 38 Oliver street, Boston, Mass., write us:

We have received an order from the Chinese Government for a complete outfit of tools for a machine shop, and also for a wood-working establishment.

These two shops are to be in connection with a large cotton mill which is being built by the Chinese Government at Shanghai.

Our St. Louis store has recently shipped a car load of machinery to Winnipeg, Manitoba, and has an order from Southern Alabama for more than two car-loads of machinery for a new agricultural implement manufactory.

We have orders on our books at the present time for machinery to go to England, Sweden, Holland, Germany and China, among the foreign countries.

We find business in this country very much improved in our line during the last two or three weeks.

We have orders on our books from nearly every State in the United States, and a number from Mexico.

We think the prospect for business is very good, but we must expect much more and closer competition then we have had during the last two years.

The manufacturers have increased their facilities so much that they are able to meet the wants of customers, and some manufacturers whose prices have been excessively high have reduced their prices so that they are now on a more reasonable basis.

The L. B. Flanders Machine Works (Special Railway Shop Tools), Philadelphia, Pa., write us:

The past year has been a very satisfactory one with us. The demand for our special tools for railway repair shops has been good. Our engine repair department has been almost constantly filled with work, and our portable boring bars for boring out cylinders in place have been in use the greater part of the time. Have run full handed constantly, and have added a few new shop tools. No changes have been made in prices of material, labor and production.

Have added to our railway specialties "Greenwood's Universal Planer Chuck" and "Campbell's Automatic Oiler for oiling the box, shoe and wedge of locomotives."

The prospects for 1883 are fair. Not so many orders for railway tools as at the beginning of last year, nor so many engagements for repair work and the boring of cylinders in place, yet we predict a fair run of trade in our several departments.

The Billings & Spencer Company (Drop Forgings and Tools), Hartford, Conn., write us:

Our sales for the year 1882 are in advance of those of the year 1881 by fifteen thousand dollars. We have run full time (ten hours per day) during the year. We have increased our facilities by the addition of machinery in our forging and finishing departments, and are now in better shape to keep pace with the demand for our goods. We have just completed our new catalogue; we send you one by mail. We have added several new tools to our list, viz.: Billings' patent double-acting ratchet drill, surface gauge, six-inch adjustable wrench, and twenty sizes of machine wrenches. The outlook with us is good for a prosperous year's business.

Bradley & Co. (Cushioned Helve Hammers and Harvesting Machinery), Syracuse, N. Y., write us:

Our production and sales for 1882 were largely in excess of 1881, and fully up to our anticipations of a year ago. During the early part of this winter we added a forge shop 40x150 feet to our buildings, and now have it in perfect working order In it we have in constant use seven of our "Bradley Cushioned Hammers," besides two drops, and several presses and shears. We anticipate a good, healthy business for 1883, but are not looking for a "boom."

The Oneida Steam Engine and Foundry Company (Lathe and Drill Chucks), Oneida, N. Y., write us:

The year just closed has been a busy one with us. Early in the spring we increased our machinery, making our capacity one third greater than before. Our special machinery has helped us a great deal, and enabled us to just keep up with our orders. Our sales have been greater than any previous year; showing that the intrinsic value of the Westcott chuck is becoming more generally known.

Orders for our new drill chuck are rapidly coming in, and the prospect of a large sale for them looks encouraging. We commence the new year with hardly stock enough on hand to make a full line.

D. Saunders' Sons (Pipe Cutting and Fitting Machines and Tools), Yonkers, N. Y., write us:

Our business of 1882 has been very satisfactory. We are now employing eighty hands, and, with our increased capacity, can now fill orders promptly. Prospects for business for 1883 are fair.

A. M. Powell & Co. (Machinists' Tools), Worcester, Mass., write us:

During the year 1882 we doubled our capacity and run our force thirteen hours per day, manufacturing our lathes and planers, and then were unable to keep up with our orders Although the present outlook is not so favorable as it was last year at this time, we believe that we shall have a good healthy trade for the coming year.

Osgood & MacNaughton (Boom Dredges, Steam Excavators, &c.), Albany, N. Y., write us:

The year 1882 has been a very prosperous year. Our business far exceeded our anticipations of last January, when we started out as a new firm. Our improved machinery meets with universal favor wherever used. During the past year we have built machines for the United States Government, Mexican Government, Panama Railroad Company, Panama Canal Company, and many contracting firms scattered all over this country.

The prospects are that we shall do a much larger business the present year than we did the past We have enough orders now to keep us busy for three months.

The Westinghouse Machine Company, Pittsburgh, Pa., and 92 Liberty street, New York, write us:

We have to note a very rapid growth of business in '82, so much so that it caught us unprepared, and we have been obliged to cancel a number of orders. Since July 1st, however, we have more than quadrupled our capacity, not so much by increase of standard tools and buildings as by the manufacture of special tools, through which we have succeeded in so systematizing our business that the above result is reached without a material increase of pay-roll.

We are now shipping from fifty to sixty engines per month, averaging 25 horse-power, with no apparent cessation of demand. We have in the last six months started our own foundry, and fitted up a very elaborate testing-room for the completed engines. We now employ 165 men in all departments, and expect during the coming year to build and sell not less than eight hundred engines.

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NEW YORK, JAN. 27, 1883.

CONTENTS.

PAGE

Convenient Foundry Arrangement..... 1
Locomotive Engine Running, by Angus Sinclair. 2
Letters From Practical Men—Machine Shop Economy—Water-Wheel Tests—Indicator Rigs—The Long and the Short of the Journal Question—The Abuse of Tool-Post Wrenches—V's and Flat ways for Engine Lathes—Cone Gears *vs.* Cone Pulleys—Notes on Lathe Construction and use.....4-5
The New Aluminum Process..... 5
Stiles Letter Copying Bath..... 6
Condition and Prospects of the Machinery Business.....6-7
A Desirable Mill Insurance..... 8
Resisting the Prison Contract System..... 8
Machine Shop System..... 8
Promoting Firemen..... 9
Questions and Answers..... 9
Manufactures..... 9
Machinists' and Engineers' Supplies.....10
Iron and Metal Review.....10

A Desirable Mill Insurance.

Such a drought as is now experienced in Maine has never been equalled in summer, when droughts are to be anticipated. Woolen mills at Camden and elsewhere along the same river, have been compelled to begin running upon half time for lack of water. It is said that the operatives are making hardly enough to pay their board, and that the mill owners are losing money, not being able to fill their orders. This is an unhappy state of affairs, but fortunately the difficulty is not unavoidable. Let every mill owner who wishes to guarantee steady running, and the filling of every order at some fixed time, put in a steam engine and boiler as soon as the kind selected can be procured. This being done and a supply of fuel laid in, a mill owner can rest secure from droughts and can confidently agree to execute orders at a given time, when his neighbors in the same business, who are obliged to depend upon the quantity of rainfall for their chances of keeping the wheels turning, cannot safely bind themselves as to time, when taking contracts. This fact has a decided influence upon customers. The greater the assurance that their orders will be filled at the time specified, the stronger is the inducement to place them with the parties affording this advantage, other things being equal. With a probability of low water every summer, and a possibility of the same every winter, causing more or less enforced stoppage of mills that depend entirely upon water power, it is easy to see that the owners of these manufactories are placed at a commercial disadvantage.

Even taken into account a probable economy in running a mill, shop, or other establishment steadily by water over running the same wholly by steam, the strong liability to droughts and expensive stoppages when depending upon water alone make it advisable in many (if not most) cases to put in engines and boilers for supplemental power.

Original outlays for the latter, also interest upon same in such cases, should be charged to insurance account—the insurance of uninterrupted running so long as sufficient orders can be obtained. The actual loss from a stoppage of the mill, and consequently of the business, doubtless in many instances this winter, has been far greater than the whole cost of steam power machinery of proper capacity to run the establishment continuously. The certain assurance of having unfailing power to run at any and every time, ought to be worth a premium as well as guarantee against losses from fire.

Another of the troubles incident to dependence upon water power in the winter, season is the freezing fast of water-wheels. A few days ago a disaster befell a large rolling mill at Cohoes, N. Y., while thawing out the turbine that furnished the motive power. The oil used in the thawing process took fire and very soon the mill was hopelessly in flames. This was a very unusual cause of fire, but the incident is very suggestive in regard to water-power contingencies.

Resisting the Prison Contract System.

The more familiar the people become with the prevailing system of hiring out the labor of convicts in prisons to private individuals, allowing the latter to get all the work they can out of the prisoners at 30 to 65 cents a day for every able-bodied man, the more determined they are becoming to put an end to that system. It would seem that almost any manufacturer who is able to secure the labor of all the men he wants steadily at an average price of 40 cents a day for each, including the use of a shop provided with all necessary permanent fixtures, besides power, *free*, ought to make money. The prison contractors thus favored do make money, and industries depending upon free labor suffer from their competition.

The government, therefore, runs opposition to private productive enterprises and lets the profits of the same go into the pockets of a few favored contractors. This injury to free industry cannot continue indefinitely. Legislatures will be obliged to act upon strong petitions for redress. For instance, the following petition to the Legislature is being circulated and signed in nearly every city in the State of Texas:

"We the undersigned citizens of Texas respectfully represent to your honorable body that the custom now in practice by the State in leasing out the convicts in her prisons, is a system at variance with the objects of punishment; contrary to a true christian spirit; detrimental to the public good; injurious to private enterprise; odious and obnoxious to all industrial classes, as tending to bring them into competition with honest labor, thereby depriving worthy toilers of employment that rightfully belongs to them," etc.

This is the most direct way to obtain justice for those injured by prison competition and prevent its injuring other trades.

Machine Shop System.

A large part of the trouble and worry of machine-shop management, and the greater proportion of the waste and loss, comes through small things—trifles, presumably of not sufficient importance to command the effort of persistent looking after. The long-line shaft gets oiled and otherwise attended to because there is too much of it to be neglected; but the little piece, out of the way somewhere, runs dry, gets out of line, and finally fails some day when it is most needed. The long line assumes an importance because it is a long line, and it is the duty of some one to see that there is no trouble from it. The short piece is not worth an appointment, and causes trouble and expense, and comes to grief.

The machine that is run regularly by some one is always in order, with all its appointments, because it is the duty of that some one to keep it so; but the machine that is used only occasionally, and then by anyone and everyone, never gets oiled till it refuses to work without it; never is provided with decent tools to work with; never has a belt in condition to drive; never gets cleaned up, except in a spasm of general shop cleaning, and is in a state of universal demoralization always.

As a matter of fact, the machine that breaks down when it is wanted, from which a good job never comes, and which wears out first, is the one that, in the common phraseology, is never used, and is not of enough importance to have the responsibility of anyone in particular connected with it. In other words, like the short shaft, it is one of the small things. The job that is not of sufficient importance to make provision for doing properly, and that any way is good enough for, is the one that costs the most, and the one that, when done, is just near enough right to be good for nothing.

So with the products of the machine shop; it is the small things that the customer finds fault with, and that vex the proprietor. Things just large enough to grumble about, and from the effects of which to treasure up prejudice. The good points, which may be about all of them, are lost sight of in the petty trouble caused by some little feature overlooked, or passed because it is a trifle, and the general impression is unfavorable, when by all laws of average it ought to be favorable. The nut that gets suddenly tight in the thread; the cap bolt that just bottoms when it ought to bind; the little inconsequential bearing with no provision for oiling; these small things are sources of more trouble than the large shaft and the big screw which are right as a matter of course, or, if they are not right, against which there is room to lodge a respectable complaint, and to cover the complaint with a reason. If anything in the way of fault-finding can be said to be universal, it is the habit of grumbling about little details of machines and machinery, which is perhaps explainable on the theory that the principal parts are now made too perfect to complain about.

Present machine-shop system has done wonders in the way of providing for taking care of things by appointment, and making things right, systematically; but it is difficult to devise a system that shall provide for everything. By and by it comes to require the addition of a pretty complicated system to look after the original one. It is easy enough to embrace and provide for the things of magnitude, but to make the same system cover the little points of shop management, and the minute details of work entirely to one's satisfaction, is not so easy.

One fault with many shop systems—perhaps to some extent with all—is in not taking sufficient advantage of the intelligence of the workmen. A good deal must always depend on those who do the work; and amongst other things, a shop system must provide for having the right men in the right places—which are all places—as well as provide what they are to do in the line of that system. The workmen's method must become a part of the general method before the latter can accomplish all that it should accomplish, and perhaps their part is the most important of all, for without their co-operation the most elaborate system will never be above the probability of vexatious failures in small things. The machine shop is well provided in that respect, in which the system covers, so far as may be, everything, and those workmen are valuable who work in harmony with it, particularly so when the system comprehends and the workmen appreciate the importance of small things.

An association of mechanical engineers is about to be organized in Baltimore, Md. The movement is a good one, and we wish it success. The engineers' societies of Philadelphia, Cleveland, Pittsburgh, Chicago, St. Louis, and other cities, have proved useful and successful, and Baltimore certainly has material to emulate their example.

We continue this week, from our last issue, our letters from machinery establishments. They furnish together the best review of the trade we are able to present. Material enough is presented to work into an essay upon the condition of the machinery business, of any desired length. As we have neither the space nor the inclination to expatiate at length upon the facts set forth in these letters, we must rest content to publish them as written, feeling assured that our readers will have no difficulty in interpreting them.

A correspondent who frequently favors us, writes advocating the buying of engine and boilers for a motive plant from the same manufacturer whenever it is possible to do so.

Our correspondent argues well from his stand-point, but we do not entirely agree with his conclusions.

The boiler and engine must each stand on its own merit, independently, and it is about as easy to determine the efficiency of one as the other. Many who build good engines do not build boilers at all, and others may build good engines and poor boilers. Similarly the builders of the best boilers may find quite enough to occupy their attention in that business, leaving to others the perfecting of the engine. It would seem to be the wisest plan to buy both engine and boiler best suited to the purpose, without much reference to whether they are both made by the same builder or not. If guarantees of duty are exacted, there is no difficulty in holding each separately to the guarantee.

As an illustration of local public enterprise applying to manufacturing establishments, we reproduce the following item from the Norristown (Pa.) *Daily Herald:*

"The good folks of the iron-clad borough of Conshohocken are keen, shrewd business men, and progressive, but we think they are about to neglect a very important matter in permitting W. T. Bate & Son to remove their boiler works elsewhere. The new line of road sweeps right through the center of these works, the property is bonded, and the Messrs. Bate must pull up stakes and leave for other quarters. Now it will be thought strange that the authorities of the borough, have made no effort to retain these works in their midst, and thus secure the benefit of a large amount of money circulated among the business men annually, earned at these boiler works. Nor have the citizens made any move in the matter. On the contrary, some of them who own land in the vicinity of the railroad suitable for the purpose have

asked five times its value, under the impression that Mr. Bate must locate in East Conshohocken. For a small piece of swamp land $5,000 have been demanded. Two offers have been made to the firm, one at Philadelphia, asking $2,400 for an acre of land, and another at Frankford, at $1,400 for an acre. A liberal offer has been made too by a gentleman at Bridgeport, so anxious are the people to have these works located amongst them. But it is very probable that Messrs. Bate will settle at the other side of the river, in West Conshohocken, as Mr. George Bullock, with his characteristic generosity and enlightened policy, has offered Mr. Bate all the ground he wants for building his works, free."

In these days of enlightened public appreciation of the benefits of manufacturing establishments in a village or city, when Western towns are offering not only land for building free, but in many cases tempting bonuses and exemption from taxation for a term of years as inducements for the locating of mills, shops and factories of every respectable and desirable kind, such a short-sighted, selfish and grasping policy as indicated above, will fail of its object. The citizens in their own interests should raise the money and pay for a site, if necessary, to insure the retention of any good manufacturing establishments within their borders.

Promoting Firemen.

Our versatile contributor, Angus Sinclair, who continues his articles on Locomotive Engine Running in this issue, (and who will continue them in future issues), gives, on pages 2 and 3, a very interesting lecture on firing engines, and the selection and training of men for the work. As a supplement to that article he gives some particulars regarding promotion of firemen, which we produce below :

In the method of promotion of firemen considerable diversity of practice is followed by the different railroads. On certain roads with well-established business and little fluctuation of traffic, firemen begin work on switch engines, and are promoted by seniority or by selection through the various grades of freight trains, thence to passenger service, from whence they emerge as incipient engineers. A more common practice, and one almost invariably followed in the West, is for firemen to begin as extra men, in place of firemen who are sick or laying off. From firing extra, they get advanced, if found competent and deserving, to regular engines. Then, step by step, they go ahead to the best paying runs till their turn for being "set up" comes round. Passenger engines are not fired by any but experienced men, but the oldest firemen do not always claim passenger runs. For learning the business of engine running, freight service is considered most valuable, and many ambitious firemen prefer the hard work of a freight engine on this account.

When a fireman has obtained the experience that recommends him for promotion, on nearly all well-regulated roads, he is subjected to some form of examination before being put in charge of an engine. In some cases this examination is quite thorough. The tendency to require firemen to pass such an ordeal is extending, and its beneficial effect upon the men is unquestioned. The usual form of examination is, for officers connected with the locomotive department to question the candidate for promotion on matters relating to the management of the locomotive, and how he would proceed in the event of certain mishaps befalling the engine. Parties belonging to the traffic department propound questions relating to road rules, train rights, understanding of time card, and so on.

The practice of two leading railroads respecting the method of examination of firemen may be taken as representative. In answer to inquiries made by the writer, the late S. J. Hayes, Superintendent of machinery of the Illinois Central Railroad, wrote: "* * * * We have no established form of questions; we simply take the locomotive as it is, and ask such questions as we deem proper regarding it, both theoretical and practical. We also examine as to their general railroad experience. We had a form of questions some years ago, but found the firemen would commit the answers to memory and repeat them 'parrot fashion,' without any clear understanding of the principles involved. Hence we abandoned that plan. Our Board of Examiners consists of the Supt. of Machinery, Division Supt., Master Mechanic and Train Master. The certificates are signed by three or more members of the Board."

General Master Mechanic James, of the Lake Shore and Michigan Southern Railway, respecting the same subject, says: "We have no regular form of questions to propound to firemen upon examination for promotion. A regular series of questions would be soon discovered and defeat itself. We examine them generally, selecting those possessing the most common sense and good judgment, and then examine them as to their understanding of valve motion, working of steam, natural and artificial draught, working of pumps and injectors, what should be done in emergencies, as flue bursting, main rod strap breaking, or driving axle, truck wheel or axle, and their understanding of rules, time card, signals, and so on."

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(28) H. E. H., So. Framingham, Mass., writes: I have used both sperm and mineral oils on light, quick-running machinery, but the parts wear very rapidly. What oil do you consider the best for such machinery? *A.*—We should not expect to find anything better than pure sperm oil. Perhaps the quality of the oil you used was not good.

(29) C. F. P., South Boston, Mass., writes: In the shop where I work the boiler is provided with a "pop" safety valve. There is a discussion as to what makes the noise, like an explosion, when the valve lifts from its seat, and we have agreed to leave it to the AMERICAN MACHINIST. *A.*—In the kind of valve you mention the arrangement is such that the valve, when commencing to blow off lifts very quickly, about ⅛″ from its seat. This allows a large quantity of steam to come suddenly in contact with the atmosphere, the concussion making the noise heard.

(30) E. A. C., Port Richmond, S. I., writes: I have four steam boilers, all fed by one No. 3 pump, which is piped to the heater and from there through 1¼″ pipe to the boilers. In the same room is a No. 5 pump, used for other purposes. The No. 5 pump has a 2½″ delivery. What I want to know is if I can safely connect the No. 5 pump and use it for feeding the boilers in case of an accident to the small pump? *A.*—Yes. You can run the large pump slowly and feed through the heater and the 1¼″ pipe without trouble.

(31) E. K., Knapp, Wis., asks: Will you give me a rule for finding the pressure per square inch on the crank-pin of a steam engine? *A.*—The effective area of a crank-pin is taken to be its length multiplied by its diameter. The pressure in pounds is the area of the piston in square inches, multiplied by the pressure against the piston. For example, take the instance of a 16″ cylinder; 80 lbs. steam pressure; crank-pin 4½″ diameter and 5″ long. The effective area of the crank-pin is $5'' \times 4\frac{1}{2}'' = 22\frac{1}{2}''$; the area of the cylinder is 201″ and $201 \times 80 = 16080$, the total pressure on the crank-pin in lbs; then $\frac{16080}{22\frac{1}{2}} = 714$, the pressure in lbs. per square inch on the crank-pin.

(32) W. M., Marietta, Ohio, asks: If I place a reflector, such as is used on a head-light, so that it may be revoled rapidly around an electric light placed in the reflector, cannot a large space be illuminated with a small light. Of course the whole space will not be illuminated at once, but the intervals between the successive appearances of the light will be so short that the eye will not be able to detect them; consequently the whole space will appear illuminated? *A.*—You cannot, by any mechanical means, make any more of the light than there is of it. You can concentrate the rays so as to intensify the illumination in a small space, or you can diffuse them, so as to feebly illuminate a large space. If you could do as you suppose, you could clearly make something from nothing.

(33) E. B., Windsor Locks, Conn., asks: I. Which is the strongest for a screw, a square, *V*, or rounded thread? *A.*—This can be definitely settled only by experiment. There is probably but little difference; not enough to influence other considerations that may make the use of either thread advisable. With nuts exactly fitted it would seem probable that the square thread would be slightly the weakest, but after some wear it might be found the strongest. Of the other common threads, viz: the Whitworth (rounded top and bottom), the U. S. Standard and the ordinary *V* thread, we do not imagine there is much difference in the ultimate strength, when nicely fitted. 2. Which thread is the most liable to clog? *A.*—We cannot see any material difference.

(34) W. L., Cleveland, Ohio, writes: "Veteran" in the AMERICAN MACHINIST of November 18, 1882, describes a method of centering small work, by using a bell-mouthed socket in the live spindle, a center reamer in the dead spindle, and a tapered piece of steel. I don't understand what he means. Will you please make his meaning plainer? *A.*—You doubtless understand how to square center work in a lathe, driving the work with a dog or by holding the end in a chuck. In order to do small work more rapidly, "Veteran" proposes to drive the work by friction in a piece with a bell-mouthed taper hole, which as you can see will avoid the necessity for stopping the lathe, and expedite the work. The tapered piece of steel is used in the tool post.

(35) E. B., Groton, N. Y., asks: If I proportion a *D* slide valve to give the best results cutting off at ¾ stroke, and then arrange by moving the eccentric across the shaft so as to give the valve more travel, to cut off at ¾ stroke, will I get as good results at the latter point of cut off as if the valve were made especially to cut off there, and if not, why not? *A.*—No. A valve of the kind mentioned, when properly designed for cutting off at any point, will not be exactly right for cutting off at any other point. The designing of a slide valve for variable cut-off includes taking into consideration the range of cut-off desirable, and then proportioning it for the best general results. It also includes a consideration of the clearance space. In this way good results are obtained. One of the principal reasons why the valve would not be equally effective at the two points of cut-off named is, that in such a valve the time of exhaust port opening and closure varies with the point of cut-off; another, that the rapidity of exhaust and steam port openings and closures is similarly varied.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

C. M. Morse, Mech. Engineer, 95 Liberty St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Mechanical Engineer. Complete motive power outfits a specialty. Peter Banta, Cold Spring, N. Y.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

J. C. Hoadley, Engineer and Expert, 28 State St., Room 28, Boston, Mass.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, Room 8, Ulich Block, Chicago, Ill.

Machine Designing and General Engineering work done by T. J. Winans, 54 M. & E. R. R. Ave., Newark, N. J.

A handsome monthly journal sent free to engineers and mechanics the year round. Send postal for it to Money Saver, 95 Liberty street, New York.

Steel Forgings, either plain or crank, up to 10,000 lbs. in weight. Address, Pennsylvania Steel Co., 160 Broadway, New York.

Light and fine interchangeable machinery to order. Foot and power lathes, slide rests, &c. Catalogue for stamp. Edwd.O.Chase, Newark, N.J.

One hand bookbinder's embossing press for sale. Size of platen, 16″ x 24″. In first-class order. Ohl & Co., E. Newark, N. J.

New Year's Present—"The Complete Practical Machinist," by Joshua Rose, 440 pp. 196 illustrations. $2.50 postpaid. Address, P. O. Box, 3,306 N. Y. City.

Boring Bars made all sizes for all purposes to bore both straight and taper work. Pedrick & Ayer, proprietors, L. B. Flanders' Machine Works, 1025 Hamilton street, Philadelphia, Pa.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

$60 saved in *one* day on *one* engine by an intelligent use of the Indicator. See Lyman's Treatise on "The Use of the Steam Engine Indicator." Price $1. Address, Edward Lyman, C. E., New Haven, Conn.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on personal application. E. E. Roberts, 107 Liberty St., New York City.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England. Mailed on receipt of P.O.O. value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

MANUFACTURES.

John Roach employs seventeen hundred hands at his Chester, Pa., ship yards.

The Springfield Glue and Emery Wheel Co., Springfield, are reported failed.

A concern at Winona, Minn., has wagon works now being built which will turn out 6,000 farm wagons annually.

According to the Cleveland *Trade Review*, there are 18,300 machinists employed in that city, to whom $7,000,000 were paid in wages in 1882.

Baster & Gebhard, machinists, Cleveland, Ohio, are reported assigned. They previously gave chattel mortgages for $9,500.

The Peekskill Manufacturing Co., Peekskill, N. Y., brick machinery and agricultural implements, are reported assigned, giving preferences for $8,000.

Wilson & Peck, Danbury, Conn., have started a new machine shop, mainly devoted to jobbing and repairing.

Greenlee Bros., & Company, of Chicago will soon place upon the market a new car-mortising machine of ingenious construction.

A new enterprise for Lapeer, Mich., is about to locate there for the manufacture of door-knobs and locks, employing about two hundred men.

A company has been formed in Charlotte, Mich., to manufacture the Moore land-roller. Mr A. R. Moore, the patentee, will be the manager.

The Putnam Tool Co., Fitchburg, Mass., will be in the market with machine tools within a few weeks. Their new shop is running.

The Morse Bridge Company, of Youngstown, O., have orders for bridges to employ them for six months to come.

A wire mill employing 200 men, a boiler plate-mill and a new converter are about to be added to the Joliet, Ill., Steel Works.

It is currently reported that the New York, Chicago & St. Louis Railroad will soon set up steel rolling mills in the Hocking Valley, in Ohio.

The P. C. Cheney Co., of Manchester, N. H., have just had the Jarvis setting applied to two more of their boilers, making four now set with this system.

The iron moulders employed at Golden State and Miner's foundry, San Francisco, Cal., have struck for an advance of 25 cents a day on present wages, which range from $3.50 to $3.25.

The capital stock of the E. T. Barnum Wire & Iron Works, of Detroit, has been increased from $160,000 to $200,000. The works are full of orders and have been compelled to increase their capacity.

The Grant Corundum Wheel Company's mill at Chester, Mass., is nearly completed; the company intends to begin manufacturing corundum wheels soon.

The Akron, O., Malleable Iron Works have been sold to John R. Buchtel at assignee's sale. The price was $4,473 which was only about two-thirds of the appraised value.

The Terre Haute, Ind., iron and nail works, are building a new nail factory, containing forty-six nail machines, which they expect to have in operation by the middle of February next. They will then have 126 machines.

The Pargetized Can Company, of Charlestown, propose to build a factory at Keene, N. H., and it will be exempted from taxation for ten years, property exempted to be of a value of not less than $15,000.

The Wetmore Machine Co., New Haven, Conn. which formerly had an agency at 34 Dey street, New York, has made an assignment. An attachment for $100,000 is out against the property of the company.

The Akron, the Hill and the Buckeye sewer pipe companies, and Robinson Bros. & Co., of Akron, O., have formed an organization to be known as the Akron Sewer Pipe Association. It is said that over $1,000,000 is represented by the new combination.

It is said that all the rubber companies of any size will enter a combination, and that the capital stock will be somewhere between twenty and thirty millions of dollars. The objects of the pool are to place manufacturers beyond the power of the importers and to insure a better and more uniform quality in rubber goods.

We learn from the Chicago *Industrial World*, that the Columbian Iron Works, builders of machine tools of that city, have shut down and the proprietor, Charles W. Parker, retired from the business. The works had been established 18 years. The plant and good-will of the concern are for sale at a reasonable price.

The Forest City Iron Works, of Clark & Atkins, Cleveland, O., recently partially destroyed by a boiler explosion, are to be rebuilt at once. A new boiler house, entirely detached from the other buildings, will be erected, an entirely new set of boilers of the most approved kind put in, and many valuable improvements to the works made.

William H. McCurdy, assignee, and Luther Allen, trustee of the Cleveland Bridge and Car Works, will sell at public auction, on Wednesday, January 17th, at the office of the company in Cleveland, the entire assets and property of the Cleveland Bridge and Car Works, both real and personal, excepting the book accounts, bills, notes and other assets in action.

Westfield, Mass., has put up more buildings in the past twelve months than in the previous eight years, expending $130,000 in new structures and nearly $10,000 more for additions and repairs. The Springvale Paper Mill cost $45,000; the Sandford Whip Company's factory, $15,000; and large additions to the H. B. Smith Steam-Heating Company's buildings, $5,000.—*Manufacturers' Gazette.*

The factories, mills, and works on the river at Camden, Me., have begun running a few hours short time for lack of water. This is never known to have happened before in the winter time. It is quite a loss to the industries of the place. The drought is also becoming a serious matter with Nashua, N. H., manufacturers. The Nashua and Jackson Companies, by judicious use of steam power, keep their machinery moving, but mills elsewhere are seriously embarrassed. It is stated that Winnepiseogee has been drawn to the lowest practicable point.—*Boston Commercial Bulletin.*

The Troy (N. Y.) Waste Mfg. Company has been organized, with a capital of $100,000.

The new Morris Hardware Company, at Youngstown, Ohio, with a capital of $100,000 has started business.

Hopkinsville, Ky., has decided to contract for water works, the same to be completed before December 31, 1883.

There is some talk of organizing another stove manufacturing company in Detroit, Mich. Heavy capitalists are interested, and if the project assumes definite form, the concern will be a large and important one.

The New Orleans, St. Louis and Chicago Railroad has lately built at their shops in Water Valley, Miss., a "hospital car," to be used when accidents occur. It is furnished with every convenience, and medical and surgical instruments.

The Sawyer-Goodman Company, at Marinette, Wis., is making improvements. A new blacksmith shop and an addition to the office are being built. The five boilers of the mill will be lengthened eight feet each, and a 100-foot smoke stack will be erected.

Never before in the history of Augusta, Ga., has there been so much improvement of every description going on. In the west end especially buildings are being erected, from the gigantic cotton factories down to the smallest cottages of two or three rooms.

The Denver *Journal of Commerce* says there are 1,275 men employed in the iron foundies and railroad shops of that city, 175 men in the rolling mills, 75 men in carriage manufactories, 650 men in smelting works and 750 men in the lumber and planing mills. It says that two years ago there were no manufactories there worth speaking of.

The Pittsburgh Bridge Company have added to their works an erecting shop 32x132, and are running to their full capacity day and night. They have in hand the New York station for the East River Bridge, and seven bridges for the Rochester & Pittsburgh Railroad, besides a number of highway bridges and iron roofs.

The Sioux River Lumbering Company has been incorporated at Bayfield, Wis , with a capital stock of $60,000. The incorporators are W. H. Irish, W. G. Maxey and John S. Stevens. The company intends to immediately begin the erection of a large mill on Sioux river. It is already erecting logging camps at Onion river, and expects to bank between 2,000,000 and 3,000,000 feet of logs there.—*Northwestern Lumberman*.

The charter of the Woodruff Car Trust Company has been filed in Pittsburgh, Pa. The capital stock is $150,000, with the privilege of an increase to $3,000,000. The object of the company is to build Woodruff parlor and hotel cars, to be leased to any lines of railroad on yearly payments, with interest, and at the end of 10 years the leasing company obtains sole possession of the cars. Henry G. Whelen, of Philadelphia, is the president of the company.

Messrs. Latimer, of Wilmington, N. C., and several New York capitalists propose to erect extensive works at Livingston Creek, about twenty miles from Wilmington, on the Carolina Central Railroad, formerly belonging to Cronly & Morris, for the manufacture of fibre from the native fibrous plants—among others the cotton stalk—and for the manufacture of cotton seed oil and fertilizers. As a base for fertilizers they propose to utilize the large deposits of marl on the property, which have been pronounced so valuable by the present and former chemist of the department of agriculture of North Carolina.

There is a project on foot for the establishment of an agricultural implement factory in Eufaula, Ala. Hon. John D. Roquemore, of that city, and Mr. Robert H. Walker, of Columbia, are at the head of the enterprise, and it is proposed to begin with a capital of $25,000, which is to be increased to $100,000. Of this sum $15,000 has already been subscribed, and if no one else wants stock, Messrs. Roquemore and Hall will take the full $25,000. It is proposed, however, to open books for subscription at an early day. The stock will be divided into shares of $50 each.—*Chattanooga Tradesman*.

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 11, 1883.

Thus far business in supplies for the new year has been rather quiet. The larger dealers are still busily engaged in clearing up their inventories of stock, while all of the dealers seem to be waiting for the manufacturers to settle upon a definite scale of prices for the present year. There is considerable inquiry, but orders continue small; however, the outloook is good, and as the year advances there will, in all probability, be a satisfactory condition of trade. Prices, so far as we can learn, are unchanged and there is a scarcity of novelties.

The Ashcroft Manufacturing Company, 111 Liberty street, New York, are now manufacturing Coffin's new Averaging Instrument, which was described in the AMERICAN MACHINIST of Sept. 10, 1881. This instrument is to do the work of a planimeter in measuring indicator diagrams. It has a further advantage of enabling the operator to read off the mean height of the diagram at once, without the use of figures. This instrument is made in two styles, namely: one to fit in the lid or till of an indicator box, also another detached style put up in a morocco case to be carried in the pocket. These instruments are all very neatly made and nickel plated.

James Beggs & Co., 9 Dey street, New York, are introducing a new vertical steam engine known as the Gardner engine. They are made in 8 sizes from 2-horse power up to 12-horse power, respectively.

The discount on Boxwood Rules is now 70 and 10 per cent. off list, instead of 66⅔ and 10 per cent. as formerly.

Iron and Metal Review.

The Pig Iron market during the commencement of the New Year, already elapsed, has been far from satisfactory. Orders continue small, consumers rigidly adhering to their conservative policy of purchasing only for immediate use. Stocks are accumulating at the furnaces, and concessions are offered to large buyers.

We quote prices as follows: Foundry No. 1, $25 to $26.50. Foundry No. 2, X, $23 to $24. Grey Forge, $19 to $20.

The market for Foreign Iron continues dull, with prices decidedly in favor of buyers.

We quote Coltness at $26; Glengarnock, $23 to $23.50; Gartsherrie, $25 to $25.50; Summerlee, $25.50 to $26; Carnbroe, $22; Eglinton, $21.50 to $22; Langloan, $25.50 to $26.

Copper is firmer this week than for some time past, and is quoted at 18c.; Banca Tin, 28c; Straits and Malacca, 21½c. to 21¾c.; Australian, 21⅝c.; Billiton, 21¼c.; English Lamb and Flag, 22⅜c. Spelter, Common Domestic, 4¾c. to 5c.; Refined, 8c. to 8¾c.; Silesian, 5c. to 5¼; Lead, 4¼c. to 4.80c.; Antimony, Hallett's, 10⅜c. to 10½c.; Cookson's, 11⅜c. to 11½c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Experienced Draughtsman wants engagement. Address J. H. care AMERICAN MACHINIST.

Wanted—A draughtsman well up in Sugar machinery, both for plantation and refinery work. Address, Z, AMERICAN MACHINIST office.

A mechanical draughtsman of good technical education and experience desires a situation. Address, Draughtsman, P. O. D. 38, New Haven, Ct.

Wanted—Having some experience, I desire an opportunity to learn the machine business in all its branches. Good references. Address, H., Box 5, this office.

Wanted—Several first-class vise hands who have been accustomed to do fitting on machine tools, must be sober and steady men. Address, Jos. B. Reed, Cairo, Ill.

A first-class mechanical draughtsman of 9 years' experience on locomotive work and general machinery, wishes a new position. Railroad preferred. Address, Link Motion, care AMERICAN MACHINIST, 96 Fulton St., New York.

A mechanical draughtsman, with first-class references is desirous of securing position where he can have surveying as well as indoor work. Verbatim copies of references shown. Salary secondary object. Address D., Box 1, care AMERICAN MACHINIST.

Wanted—A situation as Manager or Foreman of Boiler Works by a young man, 30 years of age capable of giving estimates, drawings and laying out the work has been 15 years in present situation; strictly temperate habits. Address stating salary, etc., H. Vallance, Duke St., Montreal, Canada.

Wanted—by a Western machinery establishment a good clear-headed, reliable draughtsman; married man preferred. Must be accurate, fairly rapid, and competent to watch his work through the shop. Permanent situation and good pay to the right man. Address, Box 5, AMERICAN MACHINIST office.

Wanted—A man who has had experience as foreman over lathe hands in a machine tool shop. He must have had some experience and know all the best methods of producing good work at the lowest cost. References from good sources are required. Amount of salary due largely to the ability of the man. Address, Machine Tools, AMERICAN MACHINIST, New York.

Wanted—Of desirable parties, the manufacture of machinery, to make a specialty; can furnish castings of any description. Address, Jno. Rapplegee, Waterloo, N. Y.

Wanted a good second-hand horizontal engine, fifty to seventy-five horse-power. Must have cut-off, and be in good condition. Address, J. G. Harrison, 169 Fourteenth street, Jersey City, N. J.

FOR SALE

With Immediate Deliveries,

8 new "first-class" 6 flue boilers, 50″ diameter by 18′ long; 12 6″ flues in each; manholes in each end; wrought iron lower connection to mud drums; steam and mud drums 30″ diameter, suitable lengths; 6 ft. stack iron and breecher. Boilers arranged for 2 batteries of 4 each; extra 30″ steam dome to connect the two; stack in centre resting on separate brick-work; all could be arranged for one battery; fire fronts and all fixtures if wanted.

Also, 3 new, first-class 2 flue boilers, 44″ diameter by 18′ long; flues 14″ diameter; steam and mud drums, and all fixtures. 18″ by 20″ high speed engine, with machinery complete for 1 circular mill and 3 shingle machine mills, including all shafting, pulleys, etc. Plans and specifications, with prices, furnished by

OTTAWA IRON WORKS,

Ferrysburg and Grand Haven, Mich.

Builders Parish's Improved Heavy Saw Mill Machinery.

H. W. JOHNS' ASBESTOS STEAM PIPE AND BOILER **COVERINGS**

Steam Packing, Millboard, Sheathing, Building Felt, Liquid Paints, Roofing, &c.

DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE.

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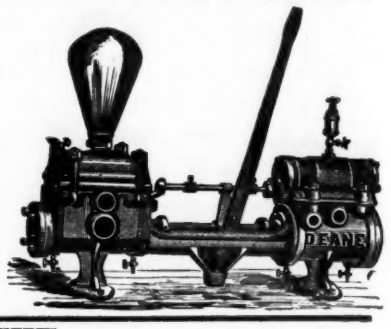
"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.



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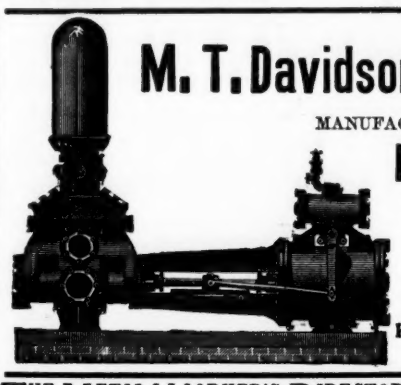

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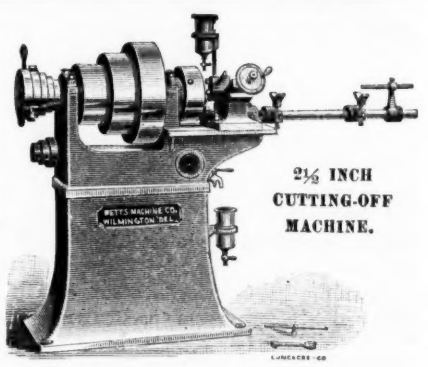

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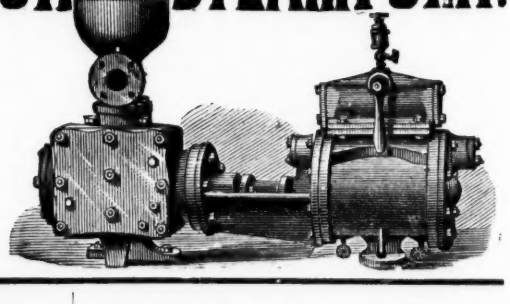

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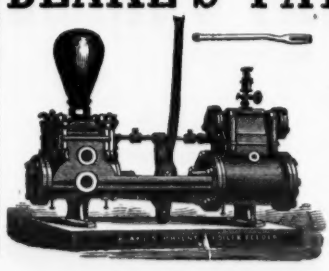

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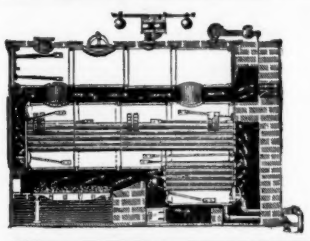

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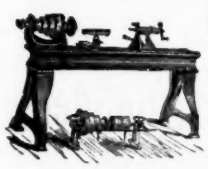

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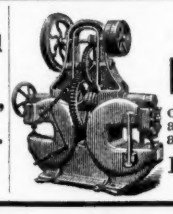

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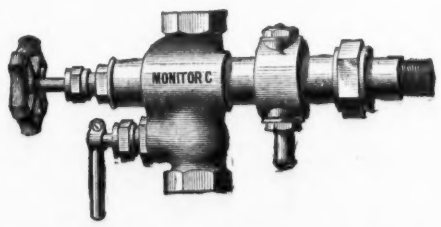

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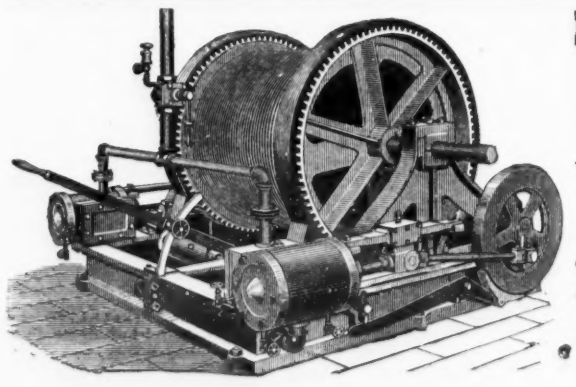

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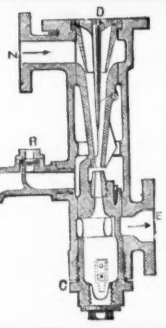

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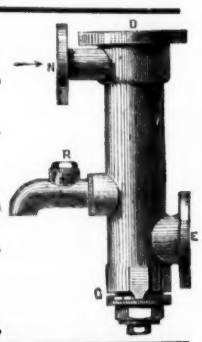

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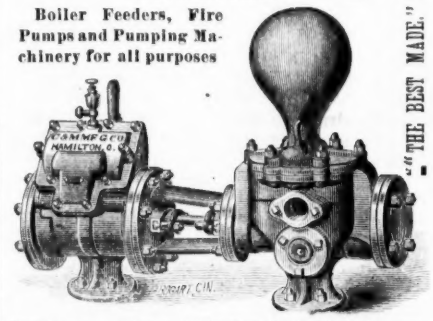

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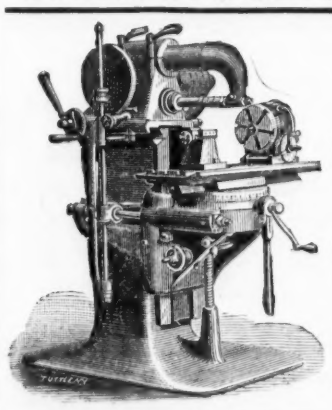

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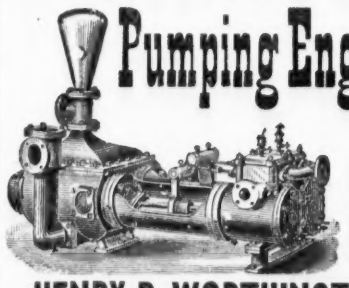

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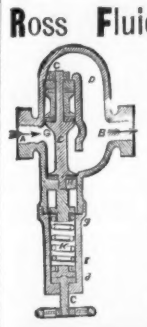

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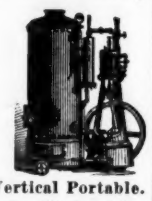

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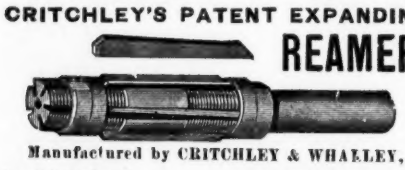

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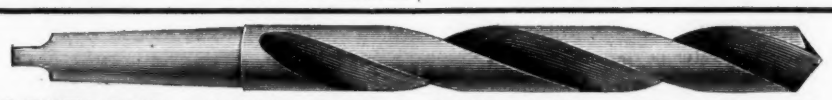

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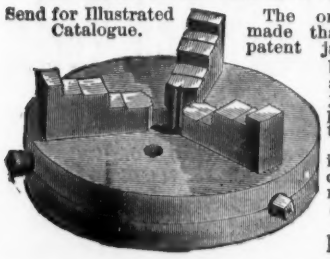

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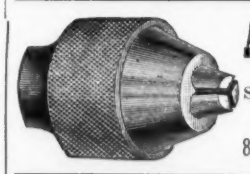

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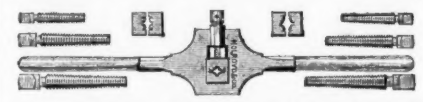

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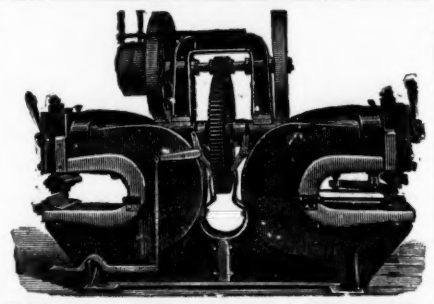

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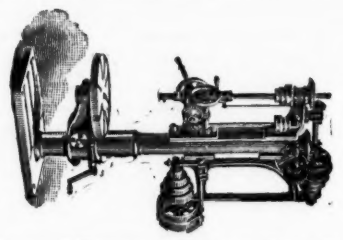

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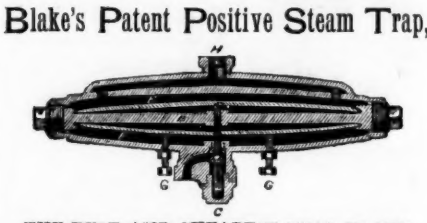

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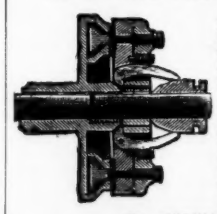

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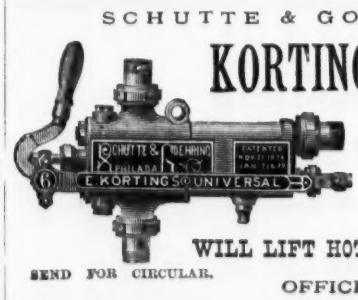

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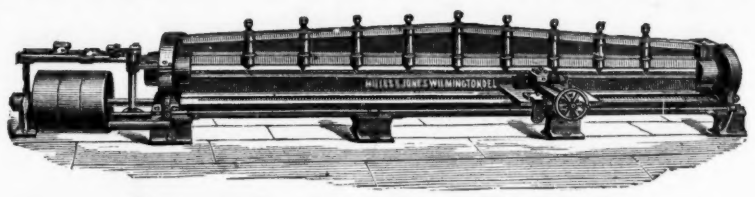

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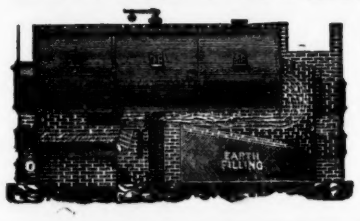

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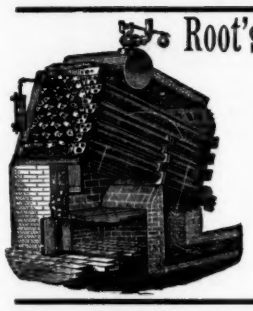

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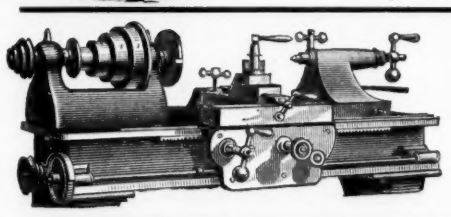

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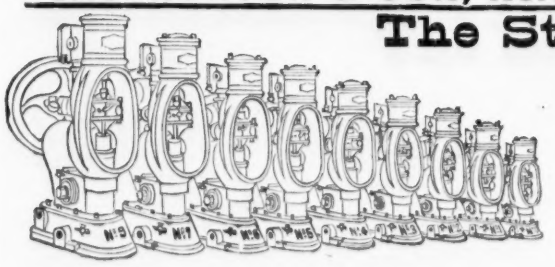

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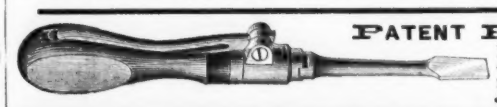

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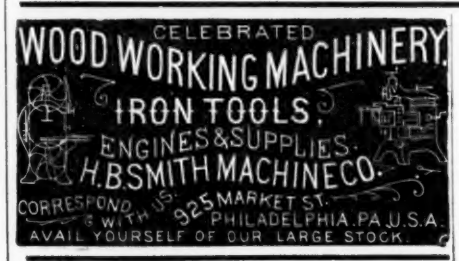

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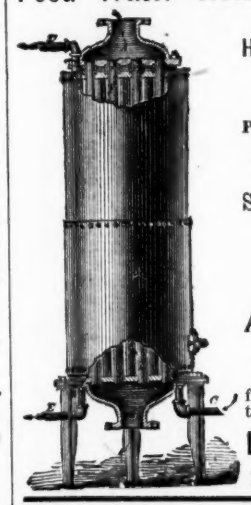

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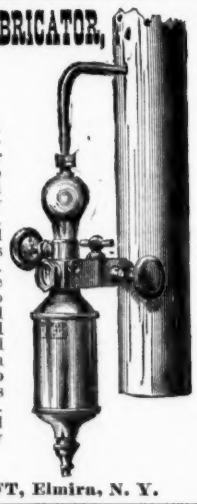

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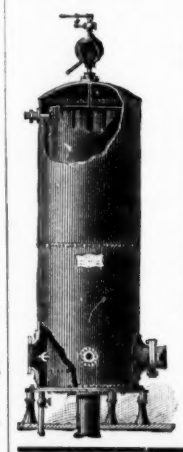

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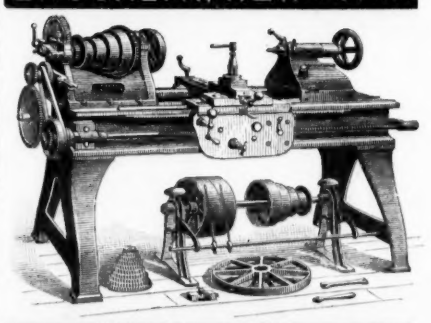

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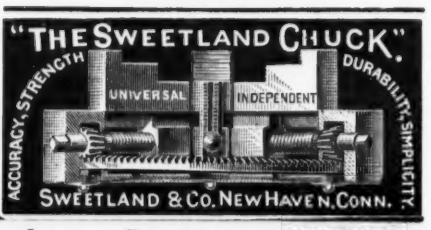

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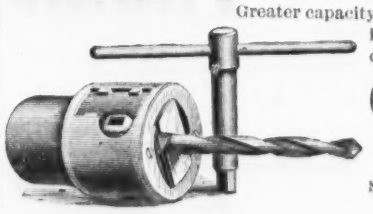

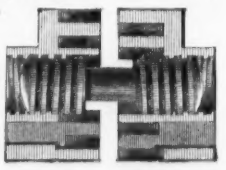

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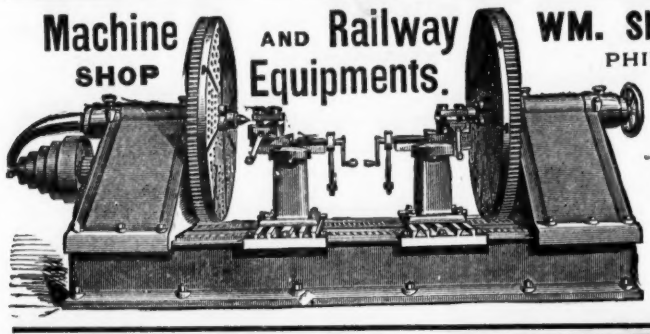

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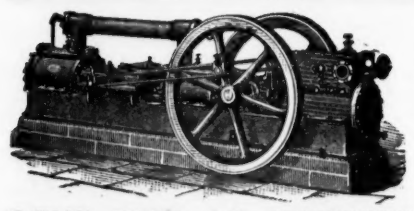

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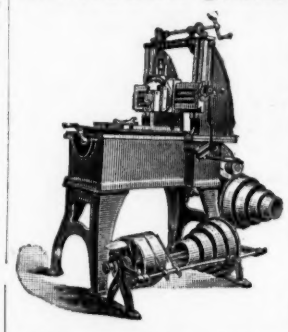

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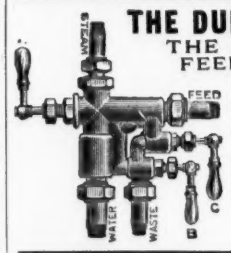

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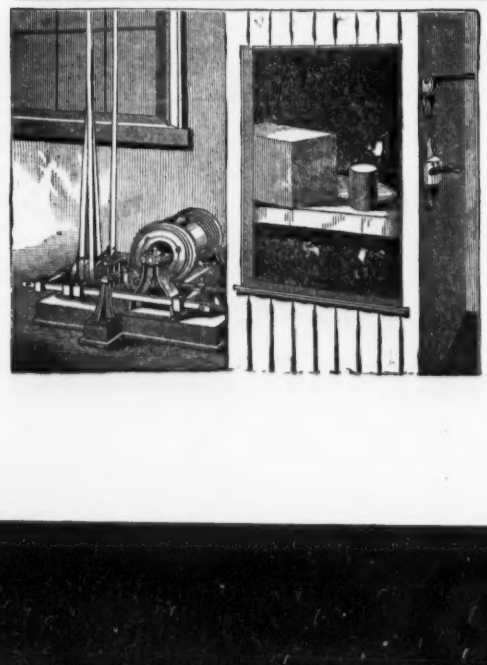

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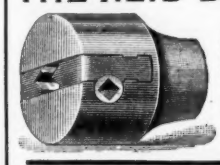

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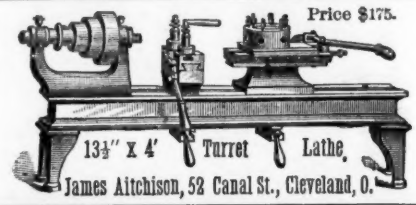

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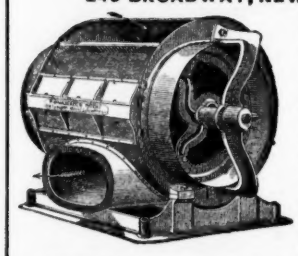

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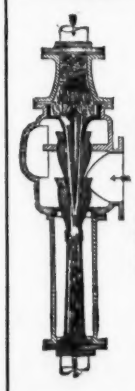

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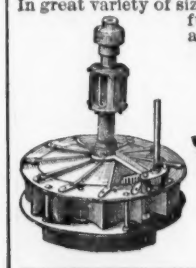

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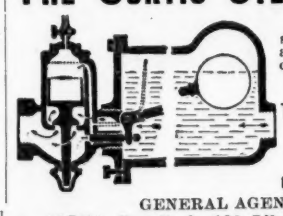

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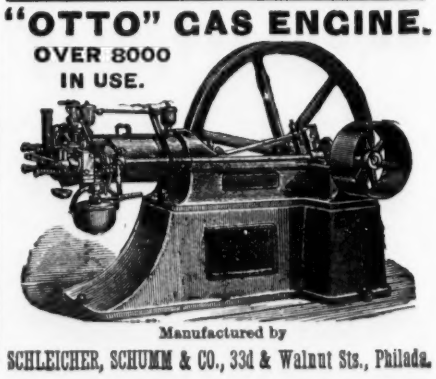

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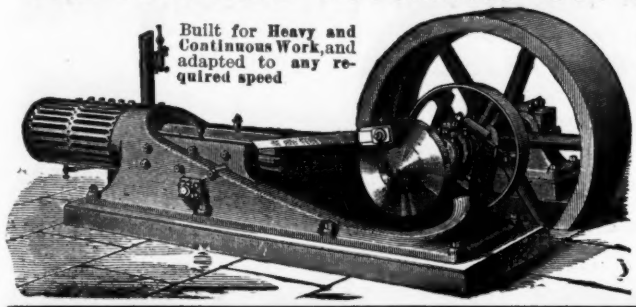

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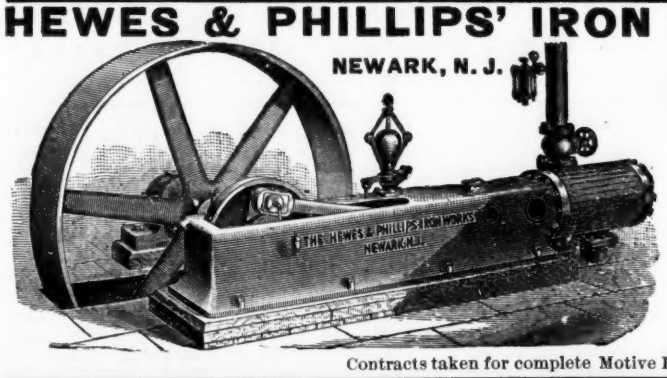

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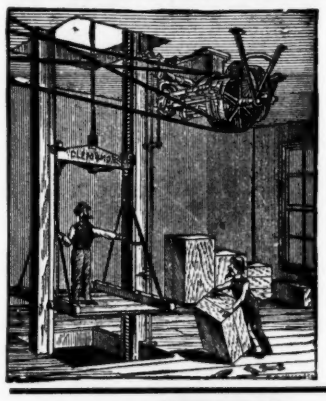

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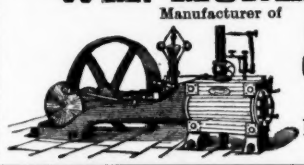

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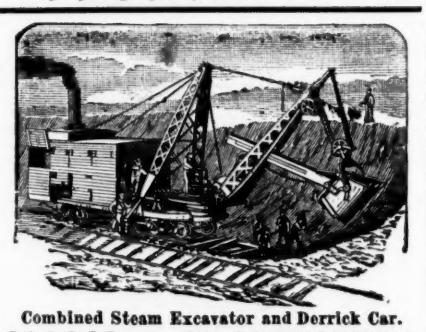

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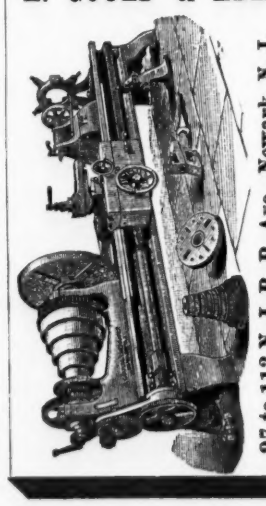

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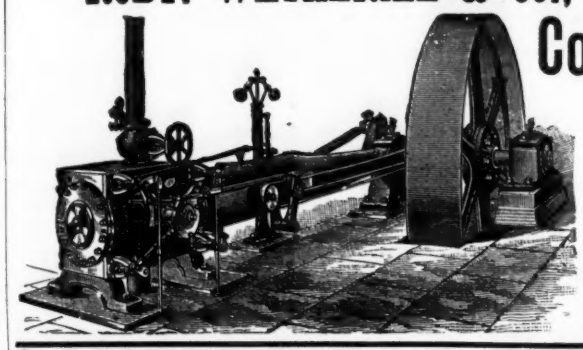

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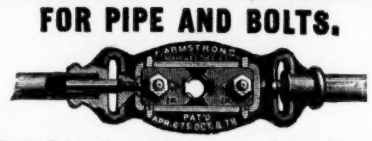

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1 each, 26 in. swing, 10 & 12 ft. bed, New En. Lathe.
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1 60 in. swing, 24 ft. bed, New Engine Lathe.
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2 22 in. " 12 ft. " " " "
2 19 in " 10 ft. " " " "
4 18 in. " 8 ft. " " " "
5 15 in. " 6 ft. " " " "
1 10 in. " 5 ft. " " " "
1 30 in. " 12½ ft. " " " "
1 26 in. swing, 14 ft. bed. " " "
1 12 in. swing, 6 ft. Hand Lathe.
1 10 in. " 4½ ft. Bed Hand Lathe.
1 40 in. x 10 ft. Iron Planer.
1 38 in. x 12 ft. " "
1 32 in. x 8 ft. " "
1 26 in. x 6 ft. " "
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2 22 in. x 4 ft. " "
2 38 in. Swing Upright Drills. B. G. & S. F.
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1 22 in. " Upright Drill. B. G. S. F.
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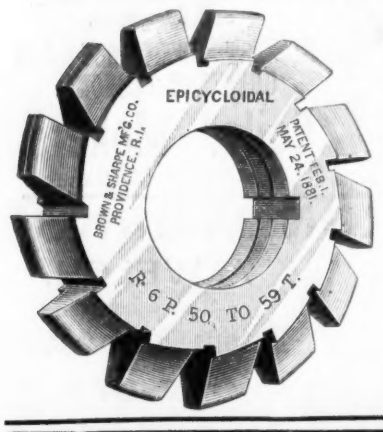
FOR THE TEETH OF GEAR WHEELS,

Which can be Sharpened by Grinding without changing their form.



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These Cutters will cut gears which are perfectly interchangeable. The white line on edge of the two left hand upper teeth of cut is left for the purpose of placing the Cutter central with work spindle. The Cutters are marked with letters from A to X, by which they may be ordered.

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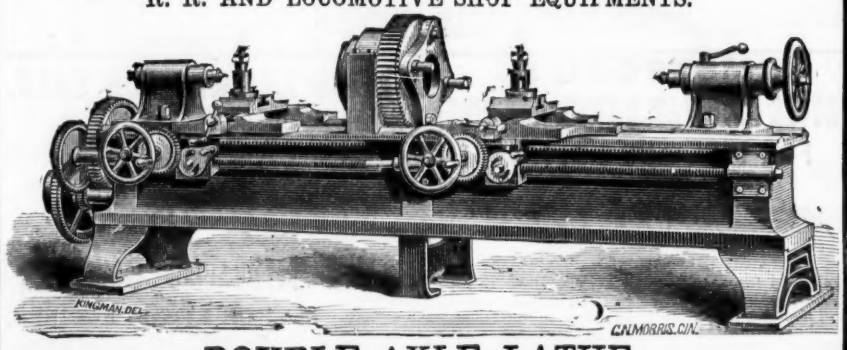

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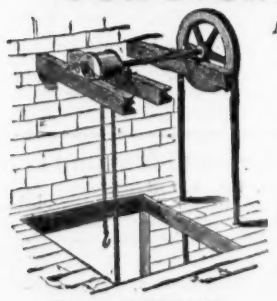

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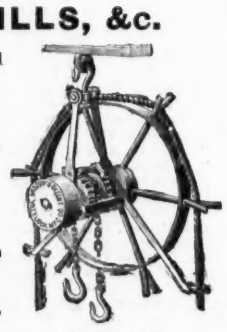

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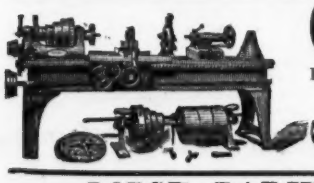

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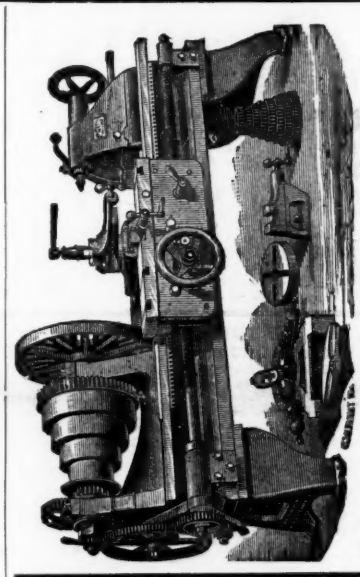

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